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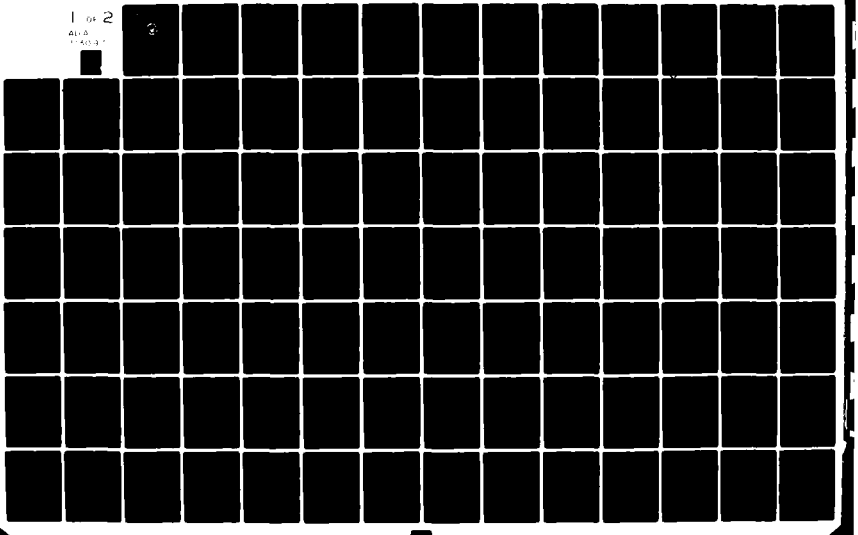

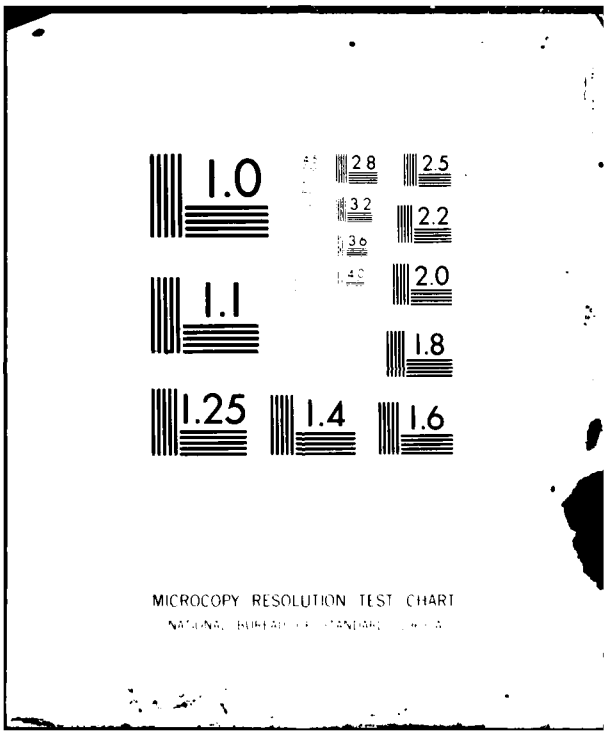
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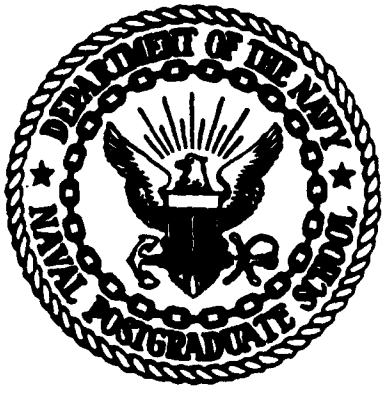

THESIS

PERFORMANCE EVALUATION METHODS FOR
ARMY FINANCE AND ACCOUNTING OFFICES

by

Albert M. Fleumer
and
Michael B. Urrutia

December 1981

Thesis Advisors: R.A. Bobulinski
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Performance Evaluation Methods for Army Finance and Accounting Offices

by

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Submitted in partial fullfillment of the requirements for the degree of

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from the

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ABSTRACT

This thesis describes the Department of the Army (DA) Financial Management Quality Assurance Program, the Finance Information Network Evaluation System and the Finance and Accounting Monthly Operations Report System. Sample performance data from Finance and Accounting Offices (FAOs) are used to develop methodologies for identifying substandard performance; to determine the effect of the (DA) Quality Assurance assistance visits on FAO performance; and to develop a current profile of the performances of the various DA FAOs in regards to the Joint Uniform Military Pay System (JUMPS). Additionally, recommendations for improvement of the DA Financial Management Quality Assurance Program are presented. Two of these recommendations involve how to develop DA and major command historical performance standards, and ways to identify substandard performances by FAOs.

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Lastly, to the ones who suffered with us month after month, for their undying patience and understanding, our deepest love and appreciation to wives and children.

I. INTRODUCTION

A. DESCRIPTION OF THE PROBLEM

In January 1981 the Commander of the United States Army Finance and Accounting Center (USAFAC) stated that it was unable to properly ascertain the effectiveness of resource utilization at the major command and installation levels due to the lack of an adequate finance operations reporting system [Ref. 1]. To alleviate this problem the Comptroller of the Army (COA), the proponent for the Department of the Army (DA) financial management systems, has recently developed a series of operational reports entitled Finance and Accounting Monthly Operations Report (FINOPS) and Financial Information Network Evaluation System (FINES) [Ref. 1]. Major General R. G. Fazakerley USA, the former Assistant Comptroller of the Army for Finance and Accounting (ACOA (F&A)), stated:

> "My responsibilities include monitoring the effectiveness of field finance and accounting offices, exercising overall technical supervision of the Army-wide finance and accounting network, providing adequate and timely finance and accounting services to the Army, and monitoring the training of both civilian and military members within the Army school system to ensure sufficient members of trained personnel are available to staff the network. Each of these responsibilities entails the expenditure of resources, and it is incumbent upon managers at every level to use these resources wisely for the good of the Army. To provide the commander and his resource manager with useful information, and to assist me in fulfilling my responsibilities, I am proposing a more effective flow of information be established between field finance offices, installation managers, major commands, and USAFAC." [Ref. 1]

The new information systems are designed to improve the flow of management information within the finance and accounting network, providing improved capability for the accurate assessment of operational effectiveness of DA finance and accounting activities. According to Major General P. P. Burns USA, the ACOA (F&A), a method for assessing the performance of installation Finance and Accounting Offices (FAOs) is required by the Director for Quality, USAFAC which can be used to determine the magnitude and directional emphasis of the Financial Management Quality Assurance Program [Ref. 2].

B. THESIS OBJECTIVE

The USAFAC Office of Field Evaluation/Analysis (OFEA) requested the authors to conduct an analysis to assist in the determination of the magnitude and directional emphasis of the DA Financial Management Quality Assurance (QA) Program. The specific objectives of this thesis are therefore to:

1. Develop a methodology for identifying substandard performance of DA FAOs.
2. Perform tests for assessing the effectiveness of DA QA assistance visits to field FAOs.
3. Develop a method which will enable the Director for Quality, USAFAC, to assess the current health of the total DA financial network.
4. Make recommendations for improvements to the DA QA Program.

C. METHODOLOGY

Research for developing the analysis of performance evaluators was accomplished by a literature search of journals, periodicals, and books, and by interviews with personnel in OFEA, USAFAC. The search also attempted to identify the financial management reporting systems currently being used by USAFAC and its subordinate FAOs.

Analyses, including probability distribution theory, analysis of variances and graphical presentation, were conducted on a sample of the DA FAO's Joint Uniform Military Pay System (JUMPS) performance data for the 18 month period of January 1980 to June 1981. These analyses were accomplished in order to establish standards and measure current performance in terms of these standards. Additionally, these analyses assessed the impact of DA QA assistance visits on JUMPS transactions performance indicators. Data was gathered through the FINES, FINOPS and the JUMPS-Army Status Reports. Conclusions were drawn as to the validity and utility of the methodologies for assessing substandard performance in the JUMPS system and the impact of the DA QA assistance visits. Finally, based on the relationship between JUMPS and other DA fiscal systems, recommendations for improvements to the overall DA QA Program were offered.

D. THESIS ORGANIZATION

Chapter II provides an overview of the concepts of management control and quality control and their relationship to the DA Quality Assurance Program. A brief overview of the Air Force Quality Assurance Program and its key features is provided for comparison. This action is taken to set the stage for later chapters. Additionally, Chapter II provides an overview of the organization and functions of the DA financial management network.

Chapter III presents a description of the two recently developed operational reports: FINOPS and FINES. FINOPS provides data through command channels to USAFAC, which is the basis for manangement to ascertain the overall performance of the DA's world-wide financial network. FINES is a management information system within USAFAC which assimilates quality and quantity performance data on field finance operations with data provided by FINOPS. Additionally, Chapter III presents the key evaluators utilized to assess the information provided by FINOPS.

Chapter IV provides an analysis of a selected sample of the JUMPS data submitted by the reports discussed in Chapter III, and presents methods developed by the authors, for evaluating performance by various FAOs. Statistical analyses in this chapter was facilitated through the utilization of the MINITAB statistical program. [Ref. 3]

Chapter V presents the conclusions and recommendations of this thesis.

II. BACKGROUND AND PURPOSE OF QUALITY ASSURANCE

A. INTRODUCTION

In order to accomplish the stated objectives of this thesis, it is necessary to first provide the reader with background material on the organizations and functions of the Department of the Army (DA) financial network. This chapter will describe the United States Army and United States Air Force Quality Assurance Programs to provide the reader with the perspective necessary to understand the various aspects of the financial management control systems to be discussed in Chapter III.

The authors contend that the effective management of financial resources requires a multitude of managerial, operational and quality controls. Harvard University's Robert Anthony, a renowned academician in the field of financial management, stated that "management control is a process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of an organization's objectives" [Ref 4: p. 452]. Additionally, he stated that the purpose of a management control system is to encourage managers to take actions which are in the best interest of the organization, with emphasis on psychological/behavioral considerations or factors. The control system can therefore be thought of as a "tool" which

when used properly, will aid in focussing personnel energies toward achieving organizational objectives.

Control systems cause individuals to direct attention and personnel energies toward those items or areas included in the control system. Ideally, these energies should be directed toward performance improvement. However, efforts are frequently directed toward beating the system, manipulation of measures, game playing, sabotaging and the setting of low standards and goals [Ref. 5: p. 68]. An individual's perception of management's use of the control system is important. It is helpful to utilize input solicited or provided by the individuals in selecting the areas to be measured by the control system [Ref. 6: p. 207].

One aspect of management of financial resources is that of quality control, which can be defined as "the process through which we measure actual quality performance, compare it with standards, and act on the difference" [Ref. 7: p. 3]. From this quote taken from Juran and Gryna, it can be seen that setting the standards is a very important factor in this process. Goals and standards should be attainable, but must also be challenging to the individuals or organization [Ref. 3: p. 29].

Quality control has taken several shapes in the past three decades. The 1950's were marked by a trend toward the utilization of complex systems, such as computers and aerospace systems. The increased use of these systems brought about unacceptable field failure rates and a subsequent

questioning of the reliability of these complex systems [Ref. 7: p. 559]. An occupational specialty known as reliability engineering emerged. The specialists, known as reliability engineers, minimized the field failure rates through the use of statistical methods such as reliability and hypothesis testing. Zero Defects, a motivational approach to eliminate defects attributable to human error, gained popularity in the 1960's among industrial and governmental activities. The Department of Defense Zero Defects Program was designed to motivate all persons directly or indirectly involved in the national defense effort to do their jobs right the first time, and everytime [Ref. 9: p. 3]. The program was an appeal to the individual's pride of workmanship, in which managerial and employee motivation played a key role. The 1970's brought about further developments in the human factors of production performance, and the organizational development and the behavioral aspects of man and machine interaction in production or operations. The human factor approach aided in the improvement of quality by reducing human errors [Ref. 6: p. 12].

"Quality" may be a difficult term to describe accurately for the authors, due to its inexactness. In one sense, the "quality" of a product or service can best be judged by the user or recipient, depending on the degree to which the product or service meets the needs of the user. A very basic definition of quality is, "fitness for use" [Ref. 7: p. 1].

Two parameters to the fitness for use concept are the quality of design and quality of conformance. The quality of design addresses the variations in levels of fitness or grades, whereas quality conformance deals with the product's conformity to the intent of the design or the extent to which it meets the design standards. Acceptable quality is "a function of the extent to which the product's quality characteristics meet the standards established in light of the customer's satisfaction" [Ref. 6: p.16].

One method managers have utilized in maintaining an assurance that quality products/service have been provided is through the independent audit function, external and internal. In the government this independent audit became known as the quality audit and subsequently quality assurance. Juran defined quality assurance as "the activity of providing to all concerned the evidence needed to establish confidence that the quality function is being performed adequately" [Ref. 7: p 2]. The DA financial management quality assurance philosophy is that the function should be performed by an organizational element under the direct supervision of the individual responsible for the management of the financial resources. [Ref. 10: p. 5]

B. ORGANIZATION & FUNCTIONS OF THE ARMY FINANCIAL NETWORK

The authors feel that it is difficult to discuss the DA financial management quality assurance program and the responsible organizational entities without first looking at the various organizational elements involved in the technical and hierarchial structure of DA financial management. It should be realized that the lines of technical communication depicted herein do not necessarily coincide with military chain of command channels.

1. Comptroller of the Army

The Comptroller of the Army (COA) is directly responsible to and under the supervision of the Assistant Secretary of the Army (Installation Logistics & Financial Management), (ASA(IL&FM)) for financial management guidance. The COA has concurrent responsiblities to the Army Chief of Staff, and has general staff responsibilities in the following basic areas:

a. Independent review and analysis of DA programs and an analysis of major DA command programs.

b. Accounting, fiscal, audit, budgetary, progress and statistical reporting, report control, cost analysis, and management analysis activities of the DA.

c. Data processing systems in support of all assigned functional areas of responsibility.

d. Continuing and independent analysis of DA organizations, functions, and procedures.

e. Review and analysis of the existing DA management system, and the development of any new DA-wide management systems which do not fall within the functional area of responsibility of any single DA staff agency or element [Ref. 11].

2. Major Commands

The DA is organized into commands which have distinct missions, all of which contribute to the overall mission of preparing the land forces for combat. These commands are called Major Commands (MACOMs). The MACOMs for the purpose of this thesis will be in two major categories; Continental United States (CONUS) and Overseas. Overseas major commands include United States Army-Europe (USAREUR), Eighth United States Army, United States Army-Japan, and Western Command.

CONUS major commands include U.S. Army Forces Command (FORSCOM), U.S. Army Training and Doctrine Command (TRADOC), U.S. Army Materiel Development and Readiness Command, U.S. Army Health Services Command, and U.S. Army Communications Command. Brief descriptions of the CONUS major commands are in Table II-1.

The three major commands of primary interest for future analyses in this thesis are FORSCOM, TRADOC, and USAREUR. The authors feel that these MACOMs are representative of the DA. FORSCOM, headquartered at Fort McPherson in Atlanta, Georgia is the organization comprised of the Army's fighting forces, such as the 9th Infantry Division, Fort Lewis, Washington, and the 82nd Airborne Division, Fort Bragg, North Carolina. Altogether, FORSCOM commands the ten CONUS-based combat divisions, ten brigade sized combat units, and nine Army Readiness Regions (reserves).

The Training and Doctrine Command is comprised of schools and training centers, including individual basic skill training facilities at Fort Benning, Georgia and Fort Leonard Wood, Missouri and advanced schooling facilities such as the Command and General Staff College Fort Leavenworth, Kansas and the DA's Senior Service School (The Army War College) at Carlisle Barracks, Pennsylvania. Doctrinal developments are carried out at the TRADOC headquarters at Fort Monroe, Virginia and the three mid-management centers, the Combined Arms Center, Fort Leavenworth, Kansas, the Logistics Center, Fort Lee, Virginia, and the Soldier Support Center at Fort Benjamin Harrison, Indiana.

The MACOMs' role in financial management is essentially that of distributors rather than consumers of funds. The MACOMs are the organizational interface between the DA staff and subordinate installations for the programming and budgeting system, and for monitoring, analyzing, and coordinating the budget formulation and execution of the subordinate activities/installations. There are generally two configurations for performing this role, the traditional Comptroller and the increasingly popular Resource Management concept.

The Resource Management concept recognizes the broad scope of comptrollership functions and interrelationships by including additional aspects of resource management, such as force management. Typically, at the MACOM level, the Deputy Chief of Staff for Resource Management has functional

TABLE II-1

PRINCIPAL CONUS MAJOR COMMANDS

Name	Function
U.S. Army Materiel Development and Readiness Command	Responsible for developing and providing materiel and related services to Army activities and installations; directing and improving performance of wholesale materiel and supply activities; supply and maintenance support to Army commands and authorized foreign customers.
U.S. Army Forces Command	Direct and supervise CONUS based Strategic Armed Forces, Army National Guard and Army Reserve unit's training; serve as the Army component of the U.S. Readiness Command; command forces oriented installations.
U.S. Army Health Services Command	Responsible for providing all matters of health services to Army personnel, dependents and retirees; command health service oriented activities.
U.S. Army Training and Doctrine Command	Responsible for individual training, education and doctrinal development; manage Reserve Officer Training Corps programs; command training oriented installations and doctrinal development activities.
U.S. Army Communications Command	Plan, engineer, install, operate, and maintain Army fixed communications systems; develop doctrine for communications.

responsibilities in management analysis, budgeting, finance, cost analysis and force managment. The inclusion of force management recognizes the resource implications of changes to the force structure and manpower documents. The Headquarters, Training and Doctrine Command is organized utilizing the Resource Management concept, whereas Headquarters, Forces Command and Headquarters, Materiel Development and Readiness Command utilize the Deputy Chief of Staff, Comptroller configuration in their performance of the MACOM role.

3. The Finance and Accounting Office (FAO)

Installations are responsible to MACOMs whose missions most closely coincide with the mission and functions of the installations. For example, an installation whose major function is strategic and supports a strategic unit (e.g. an Infantry Division) would be subordinate to the MACOM whose mission includes strategic forces: FORSCOM. The command structure can in actuality be much more complicated since there are many multi-purpose installations, however for the purpose of this thesis, the simplified interpretation will suffice.

Each installation is supported for financial administration by a finance and accounting operation, such as a FAO. It must be recognized that because of varying missions, degrees of automation, etc., not all finance and accounting operations are exactly alike. The description of

the following FAO is meant to be representative of what the reader might expect to find at a typical installation in CONUS:

a. Command Responsibility

The FAO Officer is under the direct staff supervision of the Comptroller, who is a member of the general staff.

b. Mission

The mission of the FAO is to provide financial service to the installation and activities it serves. In providing this service, it carries out the following major functions:

1. Prepares, completes, and/or certifies civilian and military payrolls; travel, commercial, and other vouchers or claims for payment.
2. Disburses funds by either cash or check, and issues savings bonds.
3. Performs financial accounting for the installation, including consumer fund and financial property accounting.
4. Provides financial data and advice; assists in preparing estimates, recommendations, plans, reports relating to financial matters.
5. Maintains control of installation funds. [Ref. 11: p. C-1].

c. Organization Army Regulation (AR) 37-101 provides that the FAO will be organized to identify the functional responsibilities of each segment of the organization and to provide a system of internal control. The fundamental internal control principles which separate the basic

functions of voucher preparation, custody of cash, and accounting must be followed. As illustrated in Figure II-1, the FAO is composed of one Administrative Section, a Central Accounting Office and six branches under the supervision of the FAO Officer.

This brief description typifies an "integrated" FAO. A more in-depth look at the functional relationships and responsibilities of the FAO can be found in Appendix A. A common variation of this configuration is the "non-integrated" finance office. Its mission is to provide financial service to combat or tactical units, and its major functions are therefore restricted to those of Military Pay, Travel, Quality Edit, Disbursing, Quality Assurance and Data Conversion. Accounting support is normally provided by a regional accounting office or a supporting installation FAO. Other finance operations whose missions are to provide on the spot financial support to small units or activities in the Military Pay, Disbursing and Travel functional areas, are the Forward Support Team and Class "B" Agent Office.

Operational reporting requirements may vary greatly among these various types of operations due to their functional differences. Although fiduciary reports are sent directly from the activity to the United States Army Finance and Accounting Center (USAFAC) by the reporting office, the typical reporting channels from the lowest to the highest echelons of financial operations would be from the Class "B" Agent to the parent FAO, through the MACOM and finally to USAFAC.

THE FINANCE AND ACCOUNTING OFFICE

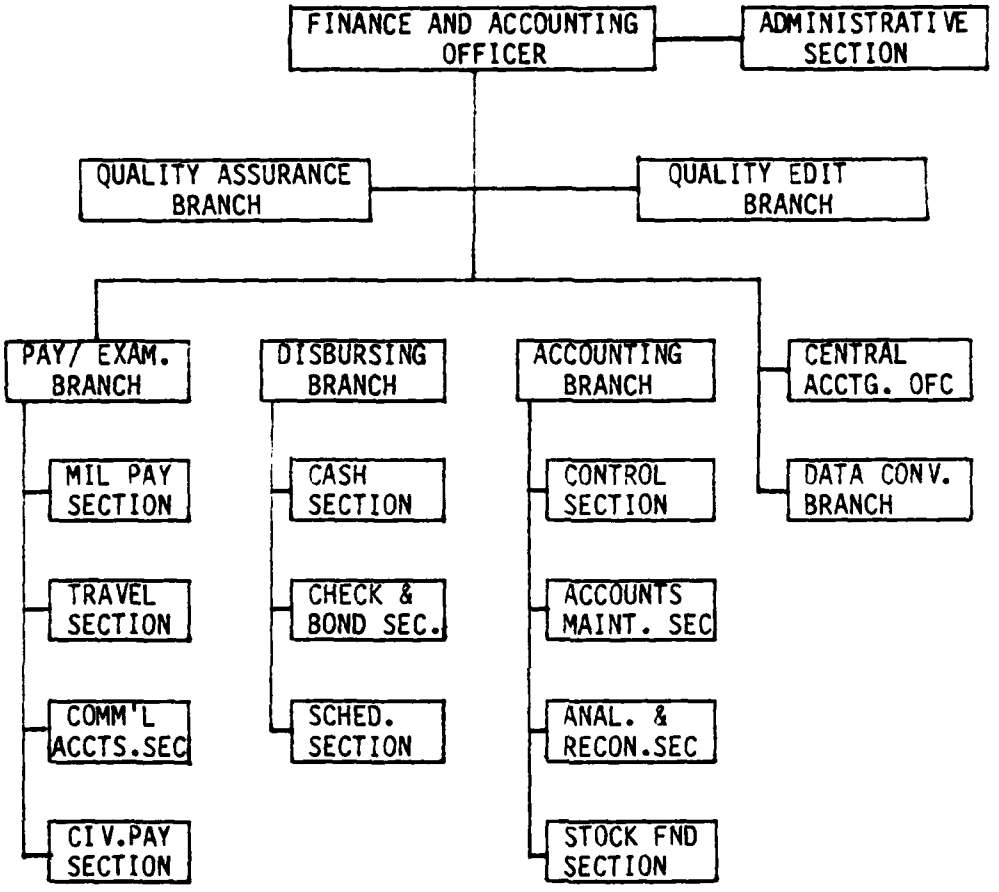

FIGURE II-1

The functions, responsibilities, and accountibility of the FAOs are founded and legitimatized by public law and decisions of the United States Comptroller General. The DA financial management system and the organization(s) designed to carry out the functions and responsibilities are quite explicitly stated in the applicable DA regulations.

C. THE ARMY FINANCIAL MANAGEMENT QUALITY ASSURANCE PROGRAM

AR 11-37 prescribes the policy, responsibilities, procedures and reporting requirements of the DA-wide Finance and Accounting Quality Assurance Program. The primary purposes of the DA program are to help identify potential problem areas, clarify procedures, and identify activities responsible for corrective action to be taken. This regulation defines "Quality Assurance Program" as "a written, time phased plan to improve the quality, accuracy, and timeliness of financial services Army-wide" [Ref. 10: p. 2]. The plan refers to all phases of financial operations including accounting of appropriated and nonappropriated funds, Military Pay and Allowances, Civilian Pay and Allowances, Disbursing Operations, Travel and Transportation Allowances, Commercial Accounts, and the payment and administration of the Reserve Component's inactive duty. The objectives of the program set forth by the regulation are to:

1. improve the quality, accuracy, and timeliness of financial services.

2. prevent the loss or misuse of money, material and facilities caused by failure to comply with prescribed procedures.

3. preclude loss or misuse of resources caused by failure to communicate financial information.

4. ensure accounting systems provide timely, accurate, managerial information in accordance with prescribed accounting procedures.

5. ensure cooperation and coordination among managerial, budgeting, and accounting personnel.

6. ensure the financial management system operates effectively.

7. ensure an adequate system of fund control.

8. eliminate duplicative accounting efforts.

9. determine financial training deficiencies and to recommend proper action.

10. determine the overall health of the finance network. [Ref. 10]

The DA policy towards the administration of the Quality Assurance (QA) Program is that all commanders will actively establish and support a quality assurance program to accomplish the aforementioned objectives. To provide the essential leadership for such a comprehensive program, the COA was given responsibility for furnishing general staff supervision. The Assistant Comptroller of the Army for Finance and Accounting (ACOA (F&A)) has been delegated the responsibility for the administration of the program and proponency for the instructions and regulations. Included in the responsibilities are the providing of Finance & Accounting assistance teams for review of FAOs. The review

of FAOs include other installation activities involved in financial management to enable an overall evaluation of the financial management system. The ACOA (F&A) program assigns specific responsibilities pertaining to quality assurance to the major command commander, major subordinate command commanders, installation and activity commanders, and FAO Officers.

The Director for Quality, who works directly for the ACOA (F&A), is responsible to him for the administration of the QA program. The mission of the Director for Quality is to formulate and execute plans and operating policies for accomplishing DA Quality Assurance Program Army-wide objectives. Additionally he is to provide independent testing and validation of all Joint Uniform Military Pay System (JUMPS) program and system changes, to include pay related accounting transactions and output; to monitor and examine the effectiveness of the disbursing office network; and to maintain a finance and accounting network management information system. The organization of the Director for Quality is illustrated at Figure II-2.

The Director for Quality provides the field operations with several key management tools to assist in the task of assuring quality service to all customers of a finance and accounting office. These tools include, but are not limited to:

DIRECTOR FOR QUALITY

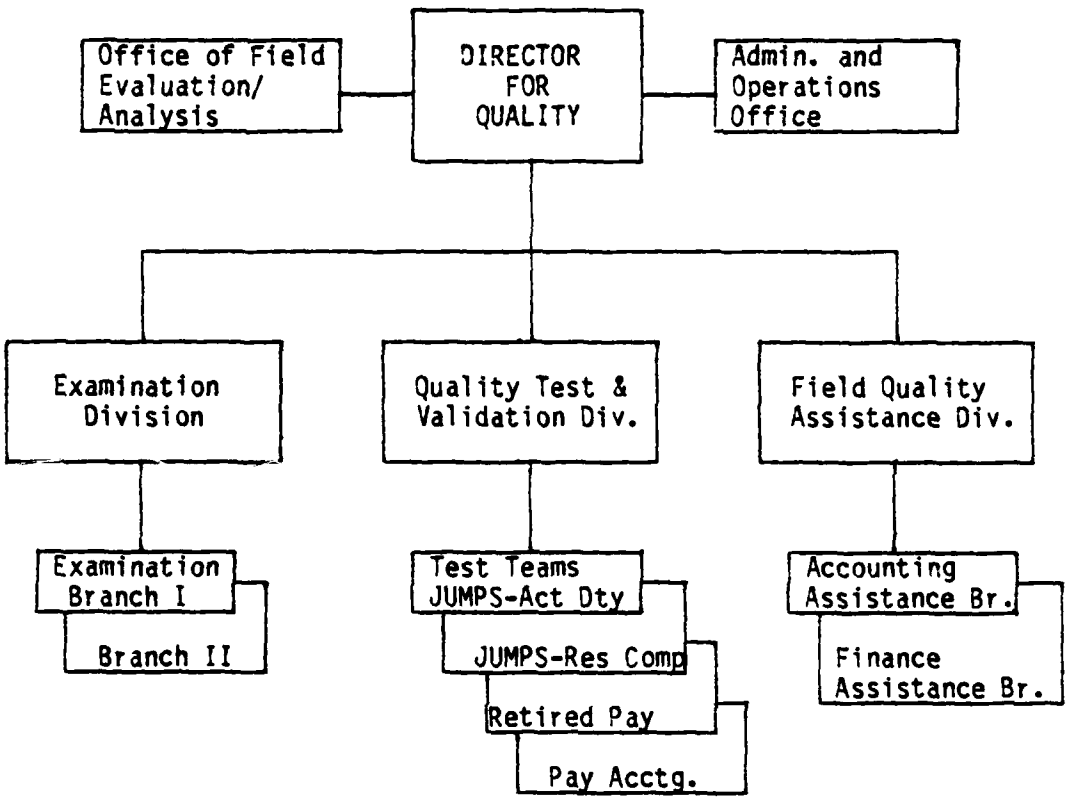

FIGURE II-2

1. the ALL POINTS BULLETIN - a monthly financial management newsletter containing a myriad of financial management information from budget and internal review articles, educational and job opportunities, to the latest changes in per diem rates and Comptroller General decision references.

2. the publishing of a monthly model standard operating procedure (SOP) for a facet of finance and accounting operations.

3. the publishing of monthly performance statistics provided on a DA-wide basis for pay related data, accounting reporting and various transaction error data.

4. standardized functional checklists for DA, MACOM and local quality assurance efforts in a proforma internal audit setting.

5. the conduct of bi-annual assistance visits by DA Quality Assurance Assistance Teams.

6. the maintenance and publishing of statistical data relating to semi-annual trend analysis, including reports to MACOMs and functional proponents.

A recent addition to the organization of the Director for Quality is the establishment of the Office of Field Evaluation and Analysis (OFEA). The purpose for the establishment of OFEA was twofold. First, to provide summary management information to the ACOA (F&A), from which he can make decisions which will improve the finance and accounting network, and second, to provide feedback to the field for items which are critical to effective management. To formulate this essential field management information, the Director for Quality and OFEA have determined a need for continuous and common data from all finance and accounting operations world-wide. OFEA monitors, analyzes and distributes JUMPS status reports, which depict statistics of input

made to the centralized computer facility for the computation of service members' monthly pay and allowances. The OFEA functions contribute to the maintenance and analysis of quantity and quality performance data of field operations. To fulfill the information requirements, OFEA correlates and analyzes data submitted via the Finance and Accounting Monthly Operations Reports (FINOPS) with additional data available within the other directorates at USAFAC (e.g. Financial Network Evaluation System (FINES)). The overall systematic evaluation and analysis of these data provide for the identification of potential problem areas and facilitate the management decisions to be made to alleviate or rectify the problems encountered by field operations.

The FAOs world-wide are responsible for the assurance of quality service provided by their operations. The effectiveness of each command's program begins at the commander's level. The regulatory requirement exists for each commander to establish and maintain a QA Program. However, the manner in which he or she provides leadership will determine the degree of success towards the attainment of DA goals or standards. The commander's interest in the monthly operations report from the FAO Officer is essential in motivating the personnel involved at the worker levels. The quality assurance effort in the FAO is formally performed by an organizational unit called the Quality Assurance Branch (QAB).

The QAB performs comprehensive operational audits of all areas within the FAO. The QAB is the FAO Officer's independent internal audit staff, and must perform audits in accordance with an annual written plan. The plan must effectively insure that all aspects of the operation are reviewed and a written report rendered of each review. The checklist developed at the DA level provides the QAB with an excellent basis for the performance of a review. Additionally, the published guidance from the Director for Quality, on topics such as the quarterly analysis of DA-wide deficiencies in financial operations, special interest items, and newly disclosed areas of weaknesses in internal control should be considered in local QA efforts/programs.

D. THE AIR FORCE QUALITY ASSURANCE PROGRAM

Recent modifications to the overall DA QA Program resemble some of the earlier United States Air Force (USAF) efforts in quality assurance. A brief overview of the USAF Quality Assurance Program is hereby provided.

The USAF Quality Assurance Program is mandated by Air Force Manual 177-10, entitled "Air Force Quality Assurance Program for Accounting and Finance Activities", which prescribes the policy and procedures related to the Quality Assurance program for USAF Accounting and Finance Offices (AFOs). Guidance is provided for all levels of command, however, there is considerable flexibility for Major Commands (MAJCOM) to supplement the directed program with companion

programs to maintain USAF desired quality levels. The USAF Accounting and Finance Center (AFAFC) recently announced major changes in the emphasis of its accounting and finance network-wide quality assurance efforts.

The USAF Quality Assurance Program in effect prior to 1 October 1980 had two primary objectives: error prevention through management and error detection [Ref. 12: p. 3]. Error prevention stressed the management processes of planning, organizing, directing and controlling. The error detection objective of the Quality Assurance Program relied heavily on a program entitled CHECKPOINTS, although other QA methods were used as well.

AFAFC designed the CHECKPOINTS program to be a uniform method of evaluating performance in accounting and finance operation at various levels of command. Initially, CHECKPOINTS utilized 22 indicators dealing mostly with timeliness and accuracy of "Reports Control Symbol" (RCS) reports submitted monthly, disbursement/collection vouchers, and military pay and leave source documents. The indicators were to be utilized to evaluate MAJCOM not AFO performance. However, data received by AFAFC was arrayed and analyzed by both MAJCOM and AFO account numbers. Performance was to be measured against standards, which were based on the most recent three year performance average. The rationale for basing the standard on a moving average was the assumption that the population would improve its performance each year,

causing the "normal level" to raise, against which subsequent year's performance should be judged. The relative value of the CHECKPOINTS evaluation system was indicated by the fact that all indicators rated by CHECKPOINTS improved, such that the level of performance accuracy for the majority of rated areas improved to better than the 98 percent level [Ref. 12: p. 4].

The recent changes in the USAF Quality Assurance Program precipitated from the realization that too much reliance was being placed upon the CHECKPOINTS program [Ref. 13: p. 4]. The Assistant Comptroller of the Air Force for Accounting and Finance stated in a November 1980 letter, that he felt that the CHECKPOINTS program did not adequately measure the overall quality and service provided by an accounting and finance office. The effectiveness of the CHECKPOINTS program was not in question; however, the desire to emphasize other important areas such as customer service and internal management has led to discontinuing the formal rating system [Ref. 13: p. 1]. The revised Quality Assurance Program for FY81 focusses its efforts on a broader base of office and resource management, customer service, training, results of Inspector General inspections and audit reports, in addition to the accuracy and timeliness of various products in the financial system.

It appears that the USAF Quality Assurance Program is directing itself toward more fully utilizing the motivational

talents within its AFOs and MAJCOMs to insure that the high standards set by the past CHECKPOINTS program continue to rise, or at least remain at those high levels. However, the USAF will continue to utilize the MAJCOMs in establishing their own evaluation systems to measure AFO performance in all AFAFC directed quality indicators.

E. SUMMARY

This chapter has provided the reader with the background material concerning the organizational elements of the DA financial network and the DA and USAF QA Programs, to gain a perspective necessary to understand the various aspects of the DA management control systems. The DA QA Program was defined earlier as a plan to improve the quality, accuracy and timeliness of financial services world-wide.

Chapter III will provide the reader with a description of the DA financial management control systems, which are active parts of the DA QA Program.

III. DEPARTMENT OF THE ARMY FINANCIAL MANAGEMENT CONTROL SYSTEMS

A. INTRODUCTION

The purpose of this chapter is to provide the reader with definitive material on the historical development and current status of the Department of the Army (DA) financial management control system. Addtionally, this chapter will clarify, through the use of narrative descriptions, the reports and data indicators used in the DA systems. An overall understanding of management control systems and particularly management information systems, will provide the reader with information necessary to understand the various aspects of the DA financial management control system.

B. MANAGEMENT INFORMATION

A management information system can be thought of as any systematic process for providing reports, data or other output [Ref. 14: p. 172]. A spy is a type of information system, as is a group of clerks who process checks and deposits in a bank. Massie states that an information system has three essential components: inputs, processes and outputs. The creation and storage of inputs, performance of processes, and creation and storage of outputs are the functions of an information system. A management information

system is defined by J. L. Massie as "an all-inclusive system for providing management with information for effective decision making" [Ref. 14: p. 253].

Management information can be conveniently categorized into the traditional planning and control processes [Ref. 14: p. 173]. Planning is deciding what should be done and how it should be done, and control is assuring that the desired results are obtained. In organizations two types of planning and control processes can be identified in relation to management information. They are strategic planning and management control. As defined by Robert N. Anthony, "strategic planning is the process of deciding on the goals of an organization and on the broad strategies that are to be used in attaining these goals" [Ref. 15: p. 7]. Strategic planning information depends heavily upon information external to a specific organization.

Management control combines this information with internal data in order to make estimates of expected results. The specifics of this information are usually unique to individual strategic problems. Management control information ties together various subactivities in a coherent way so that managers can gauge resource utilization and compare expected results with the actual results. Inputs to management control information come from various groups within the organization, often cutting across established functional boundaries [Ref. 15].

The DA, as any other large organization, has a need for management control information. The Assistant Comptroller of the Army for Finance and Accounting (ACOA (F&A)) is charged with the responsibility for the efficient and effective operation of the world-wide financial network. In order to successfully accomplish its given mission, the Office of the ACOA (F&A) must have available factual and timely information from field offices submitted through command channels.

C. FINANCE INFORMATION NETWORK EVALUATION SYSTEMS (FINES)

1. Purpose

FINES is a management information system within the United States Army Finance and Accounting Center (USAFAC). It is designed to capture quality and quantity performance data on field finance operations for the ACOA (F&A). FINES assimilates the data available through the Finance and Accounting Monthly Operations Report (FINOPS) with other data available within USAFAC. This information is accessible to all directorates within USAFAC. The information obtained through the FINES system provides for identification of potential field problems and subsequent scheduling of field quality assistance visits, based on the problems identified. The system gives USAFAC the capability for quantity and quality feedback to the field finance offices. Finally, FINES is designed to provide an overall "Health of the Finance Network" profile by individual field FAO's Disbursing Station Symbol Number (DSSN) [Ref. 16: p. 1].

2. Background

During the 1974-75 time period, the Commander USAFAC requested that a quality measurement program be developed which would be able to assess the health of the DA financial information network. The USAFAC staff proposed a list of reporting items for internal use within USAFAC [Ref. 16: p.1]. The proposed criteria were disseminated to the USAFAC directorates for coordination and comment. No further action was taken on the project until early 1976 when the project became a Comptroller of the Army (COA)-directed financial management improvement project (LR8501). The emphasis on the project was directed toward developing an information system which would have allowed USAFAC to determine which stations had the greatest need for field quality assistance. The project made little headway in developing measurement criteria due to a lack of both resources and emphasis within USAFAC's Office of the Director for Quality, the project's sponsor [Ref. 17]. In 1977 the project was reinitiated under the auspices of the Comptroller, USAFAC. The project took a new direction, that of creating an automated information system for the command. However, for many of the same reasons that plagued the project in the past it again became inactive [Ref. 16: p. 2]. In 1979 the responsibility for the project was returned to the Director for Quality. The goal of the project since then has been to develop a mechanism for providing the capability to compile and analyze quality and

quantity data available within USAFAC and from the field FAOs for the purpose of more effective management of the finance and accounting network [Ref. 18].

3. Reporting Requirements

FINES provides detailed information regarding the activities of individual field FAOs on a monthly basis. Information gathered through FINES includes summaries of audit results, Joint Uniform Military Pay System (JUMPS)-Army reporting transactions, accounting operations and centralized pay operations data.

a. Audit Results

The Office of the COA provides summary data on Army Audit Agency, Inspector General, and General Accounting Office audits conducted during the month. The data identifies the number of significant findings and the corresponding number of findings which were caused by processing failures. This data is segregated into the categories; military pay, reserve pay, travel entitlements, commercial accounts, civilian pay and accounting.

b. JUMPS-Army Reporting Transactions

Statistical information pertaining to both active and reserve forces' monthly strength balances is collected. Additional information summarizes the number of pay transactions processed, rejected, and submitted late during the month.

c. Accounting Operations

This section identifies the number of accounts which are out of balance and the total number of transaction errors committed for each account during the month. Additional information pertaining to uncleared interfund transfers is summarized.

d. Centralized Pay Operations

Summaries are presented for the total number of stop pay requests, pay option to financial institution requests, bonus vouchers, and input messages. The information is identified by the categories of military pay, travel, allotments and other transactions.

4. Future Objective

A future objective of USAFAC is to develop a data base management system that is accessible to all USAFAC directorates with the capability of including FINES report data, FINOPS report data and the results of field quality assistance visits. Additionally, the system strives to develop a network profile of the field FAOs based on the quality of service provided. It is a goal of the system to provide enough information to allow the Director for Quality to tailor a Quality Assurance Assistance Program based on problems and needs identified by this information system [Ref. 16: p. 2].

D. FINANCE AND ACCOUNTING MONTHLY OPERATIONS REPORT (FINOPS)

1. Background and Purpose

FINOPS is a management information reporting system which will provide the DA finance network with essential staffing, productivity, workload, training and performance data.

The ACOA (F&A) is charged with responsibilities which include monitoring the effectiveness of field FAOs, exercising overall technical supervision of the DA-wide finance and accounting network, providing adequate and timely finance and accounting services to the DA, and monitoring the training of both civilian and military members within the DA school system. To assist the ACOA(F&A) in fulfilling the responsibilities, a system which enhances the flow of information between field finance offices, installation managers, Major Commands and USAFAC must exist. The Finance and Accounting Monthly Operations Report (FINOP), RCS-CSCOA-67, was designed as a means of providing this needed information.

2. History

Starting in March 1948 with change 1 to Technical Manual 14-500 entitled "Finance and Accounting Operations", all field finance activities were required to submit a "Monthly Report of Operations", RCS FIN-20, to the Chief of Finance (now known as the COA). The use of this report was discontinued in November of 1950 by the publication of

Special Regulation 35-3710-1 entitled "Finance and Fiscal: Monthly Report of Operations". No operations reports were used during the ensuing five-year period until February 1955 with the publication of Army Regulation (AR) 35-3710, entitled "Finance and Fiscal: Finance and Accounting Operations". This regulation required a monthly report of operations, "The Finance and Accounting Operations Report", RCS FIN-113. The report requirement remained in effect until May 1961 when the report was retitled "Finance Operations Summary", RCS FIN-143, and became a quarterly report.

In 1971 the DA finance and accounting community underwent a change in its organizational structure. The functions of the office of Chief of Finance were transferred to the Office of the COA. Concurrent with this transfer of functions, the requirements for financial operations reports were rescinded [Ref. 19]. Up to this point, each of the operations reports was designed to provide the Chief of Finance with factual and timely operational data pertaining to the effectiveness of field finance activities, and each included operating results, staffing data, and narrative remarks.

Subsequent to the establishment of the Office of the COA in 1971 and until the FINOPS reporting requirements in 1980, no formal requirement existed for reporting the results of field operations through the chain of command to the DA staff level, and, consequently, no way to routinely monitor

operations in the field existed. As a result, managers at the major commands (MACOMs) and DA were forced to make subjective assessments regarding the services being performed by field offices.

3. Reporting Requirements

The FINOPS report provides detailed information on workload data, staffing, manhours, training and a remarks section.

a. Workload Data

Workload data in the form of selected work units for each functional area in the office and identifying the beginning and ending balances of work-in-process for critical work units is reported in section A .

b. Staffing

Authorized and assigned personnel strength, by personnel category and functional element, is reported in section B. This data is reported annually, with only changes reported monthly, thereby reducing workload in the field, but significantly increasing the difficulty of manual analysis at USAFAC.

c. Manhours

Total standard manhours available and productive manhours worked by functional element during the reporting period are reported in section C.

d. Remarks

Problems requiring command attention, normally

outside the scope of the finance officer, are reported in Section D, the remarks section. New procedures, methods or equipment which would be of benefit to others in the network are also reported in the remarks section. This section provides a forum for dialogue between the field finance offices and the major commands.

e. Training

The training profile of the finance office plus the FAO Officers' narrative evaluation of effectiveness of the traning received, in terms of job performance, is reported in section E on a quarterly basis. The quality and quantity of military training is based on attendance at military schools.

(1) Enlisted Training Status. The report indicates the percentage of enlisted personnel assigned to finance offices who are school-trained in their designated Military Occupational Specialties. At the DA level, the report will indicate how the MACOMs stand in relation to the DA-wide average for field finance offices in school-trained enlisted personnel.

(2) Officer Training Status. The FINOPS report contains information on the percentage of all officers in field finance operations who have attended the Finance Officers Advanced Course. At the DA level, the report will provide data on the percentage of officers who have attended basic, advanced and staff schools. This will allow for a comparison of the MACOMs to the DA-wide average.

4. Uses of FINOPS

The FINOPS report amasses data pertaining to the DA finance and accounting network. The report has utility at the three major levels of control in the DA's finance and accounting system. The first and lowest level of data collection in the network is the installation. The second level exists at the MACOMs, and the final level of the DA finance and accounting system is the DA staff level.

a. Installation

At the installation, the FAO Officer now has information at his or her disposal which can be of assistance in identifying existing and potential problems. Backlogs and unfavorable trends can be identified and analyzed; overtime utilization monitored and justified; staffing defended in terms of work accomplished; and productivity measured. The report assists the FAO Officer in identifying and assessing the impact on mission accomplishment of time lost due to administrative absences, training and leave. The report enables the officer to highlight both his or her training needs and training programs to his or her commander. Finally, the narrative section gives the FAO Officer a vehicle to surface problems which require command assistance in resolution.

b. MACOM

At the MACOM, analysis of the reports provides a profile of the finance network within the command, and serves

as an indispensable tool in the development of a strong quality assurance assistance program. Finance organization structures and staffing can be evaluated in terms of capabilities to accomplish assigned missions. A knowledge of personnel staffing and vacancies can enable the command to assist installations in recruiting civilian personnel and requisitioning military personnel to fill vacancies. Finally, the composite training status aides the training manager in requesting and obtaining quotas to selected courses and requesting the assistance of mobile training teams from the proponent activity where appropriate.

c. DA

The analysis of the information provided by the FINOPS report allows the ACOA (F&A) to better communicate the needs of the DA finance and accounting network to the DA staff. Typical organization structures can be evaluated in terms of both workload and mission capability, with appropriate modifications initiated and defended. New procedures can be analyzed. In addition, the ACOA (F&A) can effectively recommend assignments of qualified personnel to field stations with real and documented needs.

5. Implementation of FINOPS

The implementation of FINOPS is divided into three separate phases. Phase I was a manual system submitted through command channels. Phase II consists of interfacing the manual FINOPS system to the Finance Network Evaluation

Systems (FINES) within USAFAC. Phase III will be the final phase where the system becomes fully automated and integrated into the JUMPS-Standard Finance System (STANFINS) (the standard DA accounting system) system of accounting and reporting [Ref. 20].

a. Phase I

Phase I began at the beginning of fiscal year 1981, i.e., October 1980. The report was manually prepared in the field, submitted through channels by mail, and manually analyzed at USAFAC.

b. Phase II

In early 1981, the manual data base established in Phase I began the initial stages of automation and interface with FINES. This interface facilitates the construction of a comprehensive profile for each DSSN/Fiscal Station Number (FSN) in the DA. From this profile will evolve the capability for fielding a more effective and comprehensive quality assurance program. To formalize the FINOPS report, the reporting requirement is being incorporated into AR 11-37.

c. Phase III

In the final phase, the field input will be integrated into the productivity modules of the JUMPS-Army coding system, (JUMPS redesign) and the Standard Army Accounting System (STANFINS redesign). This will eliminate manual preparation of the report in the field, and will result in the data feeding directly into the USAFAC data base

via Automatic Digital Network (AUTODIN), an electronic data transmission and processing system.

6. Summary

FINOPS will provide the ACOA (F&A) with the capability to monitor the DA's finance and accounting networks. The authors contend that this capability is essential if the ACOA (F&A) is to effectively manage the finance network. The report insures a continual flow of information up the chain of command. The section pertaining to training will allow USAFAC to be more effective in interfacing with TRADOC and the Institute of Personnel and Resource Management concerning the adequacy of current courses of instruction and in identifying future training needs. Finally, the remarks section provides an open forum to identify problems, highlight innovative ideas, and promote a general information exchange within the DA's finance and accounting network.

E. DEVELOPMENT OF CRITICAL DATA INDICATORS

The ACOA (F&A), the DA proponent for financial management has defined "critical data indicator" as "the essential quality or quantity element(s) in a performance evaluation of a functional area." [Ref. 20].

The establishment of critical data indicators for specific functional areas, and the reporting and analysis of such data will provide the necessary information to ascertain the overall health of the finance network. Reporting quality

and quantity data by field stations, will provide a continuous and consistent stream of pertinent information to be utilized at various levels of management in determining and evaluating the field stations' ability to accomplish assigned missions. The determination of critical data indicators is made by the ACOA (F&A) and his staff. The list of indicators may be changed or expanded by the ACOA (F&A) as time progresses. How the data will be utilized depends on the level of management analyzing the reported data.

The compilation and evaluation of these critical data indicators by various levels of management will facilitate the development of operational profiles within that level of management. For example, the evaluation by the TRADOC of the critical data indicators for TRADOC installations will provide a TRADOC profile. Headquarters, TRADOC will be able to detect problem areas and workload inefficiencies as well as superior performances within the major command. The evaluation at the DA level facilitates the development of a profile for the entire DA. Brief desciptions of the current critical data indicators by functional areas are in Table III-1.

F. CURRENT USES OF DATA

1. Basic Uses

Interviews between the authors and DA financial management personnel indicate that the performance data collected in the FINES and FINOPS reporting systems are

TABLE III-1

CRITICAL DATA INDICATORS

Functional Category: Disbursing

Indicator	Purpose
Number of Losses of Funds	to identify potential problems in cash operations, requiring investigation
Number of Fraud cases	to identify fraud trends against Army-wide statistics
Number of Droppages / Number of Payments	to establish trends on the number of quarterly droppages in relation to the total number of cash payments

Functional Category: Quality Assurance

Indicator	Purpose
Reviews completed / Cumulative reviews started	to assess the percentage of reviews initiated which are completed, shows activity of local QA programs
Manhours assigned / Total manhours assigned to the FAO	to determine the relative level of personnel resources committed to the local QA program

Functional Category: Accounting

Indicator	Purpose
Errors on 302 Report / Numbers of Records passed	to determine error rates and accuracy of 302 Report submissions
Number of late 302 Reports	timeliness of critical report submissions
Number of late 304 Reports	"
Number of late 1061 Reports	"
Number of Uncleared Transactions by Others (TBO) over 60 days old / Total Uncleared TBOs	to isolate the 70% uncleared TBO's in excess of 60 days, to reflect timeliness of processing TBOs

TABLE III-1 (cont.)

Functional Category: Travel

Indicator	Purpose
Actual output / Standard output	to assess the volume efficiency of the labor force
Ending balance of number of settlement vouchers / total vouchers processed - number of workdays	to determine and analyze the number days backlog at month end
Summary level standard manhours / Assigned manhours	to assess the staffing level in relation to the level required by the summary level performance standards

Functional Category: Commercial Accounts

Indicator	Purpose
Summary level standard manhours / Assigned manhours	to assess the staffing level in relation to the level required by the summary level performance standards
Ending balance of number of Receiving Reports & Invoices / total number processed - number of workdays	to determine and analyze the number of days backlog at month end
Earned discount dollars / total discount dollars available	to determine the operational efficiency of the activity in earning available discount dollars

Functional Category: Central Accounting

Indicator	Purpose
Transactions processed / Manhours assigned/available	to determine trends relative to staffing levels and volume of work
Ending balance of Daily Activity Reports / Number of NAFIs serviced	to determine the number of days of unprocessed activity reports on hand
Ending balance of number of Invoices & Receiving Reports / total number of Invoices & Receiving Reports - number of workdays	to determine the number of days work on hand

TABLE III-1 (cont.)

Functional Category: Military Pay

Indicator	Purpose
JUMPS-Army Reject Rate	to analyze the level of rejected JUMPS-Army input transactions and to identify potential problems/ trends
JUMPS-Army Late Pay Change Rate	to establish and analyze trends in timeliness of pay service
$\frac{\text{No. of transaction cards submitted during the last 3 updates of a processing month}}{\text{total transaction cards submitted for the month}}$	to determine if operations are using cyclical or batch processing by delaying input until the final 20-25% of the update cycles
Number of people paid correctly	to determine the effectiveness of the FAO in providing proper pay service
Number of accounts per clerk	to determine the relative staffing level to the number of soldiers serviced

Functional Category: Civilian Pay

Indicator	Purpose
$\frac{\text{No. of unacceptable retirement packets received}}{\text{total number of retirement packets received}}$	to determine the quality of civil service retirement packet submissions
$\frac{\text{No. of inquiries}}{\text{Average No. of accounts}}$	to assess the quality of pay service provided, based on the number of inquiries
$\frac{\text{No. of retirement packets received}}{\text{No. of retirement packets received more than 30 days late}}$	to determine the timeliness of retirement packet submission, directly reflecting timeliness of receipt of retirement benefits

[Ref. 16: pp. 24-27]

useful throughout the DA finance and accounting structure. Primarily, the data is used to make comparisons among MACOMs and among individual DSSNs within the same MACOM. The statistical comparisons of the data are also useful as a means to assist the Director for Quality, USAFAC, in determining which FAOs are in need of an assistance visit. The data can be used to establish performance standards for individual MACOMs or for the DA as a whole. These standards may be based on past performance, making it possible to compare current performance to the standards and determine whether there is any trend in the data and if so, whether the trend is toward increased or decreased performance.

2. Measurement of Efficiency

The FINES and FINOPS reporting systems furnish information which can be used for determining efficiency. Efficiency is the ratio of outputs to inputs, or the amount of output per unit of input [Ref. 15: p. 173]. For example, DSSN number one is more efficient than DSSN number two if it either uses fewer resources than DSSN number two but has the same output, or if it uses the same amount of resources as DSSN number two and has a greater output. In practice, the second type of efficiency comparison requires a quantitative measurement of output, which turns out to be a more difficult type of measurement in many situations.

Effectiveness is the relationship between a work center's output and its stated objectives [Ref. 15: p. 173].

The more these outputs contribute to the accomplishment of the objectives, the more effective the unit is. Both objectives and outputs are often difficult to quantify, thereby making meaningful quantitative measures of effectiveness difficult to develop. No attempt is made to assess effectiveness through FINES or FINOPS, since no effectiveness objectives or goals are currently stated or in use. The efficient office may well be ineffective and vice versa.

The authors believe that without a quantifiable statement of objectives, the effectiveness of an individual FAO cannot readily be judged. It is the authors' opinion that the assessment of the efficiency of individual FAOs as well as the efficiency of the MACOMs in financial management areas of concern can be facilitated by the analysis of the information collected through the FINES and FINOPS reporting systems.

The efficiency of an operation can also be assessed by its conformance to predetermined performance standards. Two areas reported under FINOPS lend themselves well to the establishment of predetermined standards similar to methods utilized in the industrial engineering community. These areas are workload data and staffing requirements. The other areas reported, including acceptance rate for JUMPS-Army transactions, late pay change rate and the percent of transactions input during the last three updates of a JUMPS processing month, can be better compared through the use of historical standards or moving averages.

The development of either type of standard accomplishes two things. First, it sets an acceptable level of performance for measuring efficiency. Second, setting standards precludes the arbitrary measurement of efficiency in terms of the performance of another FAO. The authors contend that establishing standards is not easy nor will it be a panacea for solving efficient measurement problems for FAOs. Careful consideration must be given as to the type of standard established for each area within the FINES and FINOPS systems.

3. Utility to Levels of Decision Makers

Within an organization, the information needs of decision makers change relative to their position in the organizational hierarchy. Lower echelons within the organizational hierarchy require information on a more detailed and timely basis than do the echelons toward the top. FINOPS data has utility at each level of control within the DA's finance and accounting system.

At the USAFAC level, the reported data plays an important role in assessing current performance of MACOMs in relationship to past performance. Additionally, adverse trends are readily identified and the individual FAO performing at a substandard level can be targeted for a corrective assistance visit. This is the level of decision making which will be addressed in the data analysis portion of this thesis.

The MACOMs and installations will find much of the data reported through FINOPS useful in trend analysis and staffing requirements. This thesis does not specifically address either of these levels of decision making.

G. SUMMARY

This chapter has provided the reader with material concerning the historical development and current status of DA financial management control systems. This chapter described FINES and FINOPS, the two primary management information systems used by USAFAC in monitoring the performance of field FAOs. FINES is a management information system internal to USAFAC, which was designed to report quality and quantity performance data. FINOPS is a reporting system which provides USAFAC with detailed monthly information as to workload, staffing, manhours, and training of field FAOs. Key elements of the DA financial management control systems are the "critical data indicators" developed for use by FINES and FINOPS.

Chapter IV will provide the reader with author developed methods for identifying substandard FAO performance; assessing the effect of QA assistance visits on FAO performance; and establishing a network profile of the current health of the DA financial management system utilizing some of the critical data indicators descibed in Chapter III and data submitted through FINES and FINOPS.

IV. ANALYSES OF DATA

A. INTRODUCTION

This chapter provides the reader with the analyses of data from which methodologies will be derived for identifying substandard performances by Department of the Army (DA) Finance and Accounting Offices (FAOs) and for enabling the Director for Quality, United States Army Finance and Accounting Center (USAFAC), to assess the current health of the overall DA financial network. This chapter will also describe a test for assessing the effectiveness of the DA Quality Assurance (QA) assistance visits. The analyses were based on a sample of FAO's Joint Uniform Military Pay System (JUMPS)-Army transaction performance data. The sample data will be examined through the use of various statistical tests to determine the appropriate analytical model to be used for developing the methodologies. Additionally, this chapter provides the necessary background to allow the Directorate for Quality, Office of Field Evaluation/ Analysis (OFEA) to utilize the methodologies developed in this chapter to assess performance for other critical data indicators not discussed in detail in this thesis.

The current aggregation of data at USAFAC is suitable for numerous methods of statistical and graphical data analysis for measuring performance. However, USAFAC does not currently analyze FAO performance in terms of DA/MACOM

performance standards, or evaluate the overall statistical performance of a FAO in terms of the critical data indicators described in Chapter III. Current methods for assessing the performance of a FAO consist of a bi-annual assistance visit provided by the DA QA Assistance Teams, and a periodic examination of supporting documentation and payment documents. The assistance visit, previously descibed in Chapter II, provides a thorough review of administrative and accounting controls within the FAO. The authors were requested by the OFEA to develop methodologies for assessing the overall performance of the DA financial network through the objectives set forth in Chapter I.

A word of caution must be provided at this time in interpreting statistical validity and significance and relating it to practicality in real world application. The authors will state, throughout the remaining chapters of this thesis that statistically significant differences exist in several of the alternatives and tests. However, these differences may not be of any practical use or real world application. Conversely, real differences may be present but not brought forth in statistical analyses. The use of the statistical facts disclosed in this thesis remains judgmental.

Conclusions concerning the relevance of the methodologies developed to the overall effort of the Director for Quality will be presented in the final chapter.

B. DATA SAMPLE

Data was collected from a sample of DA FAOs, during the period January 1980 through June 1981. The data submitted via FINOPS has only existed since January 1980, including the FINOPS test period, whereas the aggregation of JUMPS transaction data has been conducted for many years. The data collected for the purpose of analysis in this thesis dealt with JUMPS transaction performance, which the authors will refer to as the Military Pay category. Within the Military Pay category, the analysis was further limited to three areas as follows: the acceptance rate of pay change documents processed during the month, the percentage of late pay change documents, and the percentage of pay change document transactions submitted during the last three JUMPS update cycles of the processing months. Military pay was selected for analysis because of its broad scope: it is an area within the finance and accounting operation which affects all military personnel. In any case, the lack of complete and consistent data in the other critical data indicators for the 18 month period effectively restricted the analysis to the Military Pay category data. As previously stated in Chapter III, FINOPS implementation did not occur until late 1980, thereby precluding the development of a complete 18 month data base in most of the critical data indicators. The selection and determination of critical data indicators was (and still is) a continuous and evolutionary process, making it virtually

impossible to collect consistent and common data for other than the three critical data indicators for the period January 1980 through June 1981.

In selecting the FAOs to be used in the sample, it was decided by the authors that performance data from FAOs in three major commands (MACOMs), Training and Doctrine Command (TRADOC), Forces Command (FORSCOM), and United States Army Europe (USAREUR) would be considered. Other MACOMs did not provide a large enough sample size (20 FAOs in 11 MACOMs) in order for the authors to develop overall methodologies. It was felt by the authors that the three selected MACOMs reflected the mainstay of the DA FAOs while providing insights into offices where the missions and staffing compositions were clearly different. The FAOs within each MACOM were considered to form a homogenous group.

From a population of 88 FAOs in the three aforementioned MACOMs, a sample size of 54 (18 from each MACOM) was randomly selected. It was felt by the authors, that this sample size was sufficient to insure reliability.

C. DATA EXAMINATION

The analysis of the data sample should be performed in accordance with generally accepted analytical techniques. In order to determine the proper techniques to be utilized, one must first examine the data sample. The examination may consist of various statistical tests for which the results will describe some of the properties of the data sample.

Performance data over collected over a period of time, such as the 18 month sample of this analysis, is often referred to as a "time-series". It is of interest in an analysis of time-series if the data (ie. performance) will change by a relatively constant amount over each time increment (ie. monthly). The method utilized to determine this constant change is linear regression or linear trend analysis. The development of a trend line may not be sufficient to evaluate and predict performance. In determining the usefulness of a regression equation or trend line, one must be cautious and consider other statistical factors and tests of the data sample in addition to the development of the regression equation. These factors or tests include but are not limited to the ones discussed in the following section.

1. Data Factors and Tests

The factors and tests discussed in this section will evaluate the data sample sufficiently to determine its suitability for regression or linear trend analysis.

The coefficient of determination (r^2), which measures the fraction of the total variation which can be explained by the regression line, may be used to measure how useful the regression line is for predicting or forecasting performance. The closer the r^2 value is to the value of 1 (100%) the better. The decision of what magnitude constitutes a satisfactorily high value of r^2 is largely judgmental.

The correlation coefficient (r), measures the linear relationship between the variables of the regression line. A value close to 0 will lead one to the conclusion that the variables are not linearly related, whereas a value close to the value 1 in magnitude will show strong linear relationship between the variables. The correlation coefficient is the square root of the coefficient of determination.

Serial correlation or the data sample is a regular pattern displayed by the data about the regression line. Tests of serial correlation (autocorrelation) are often useful in examining the randomness of data obtained in a sample. A test of serial correlation is the "Durbin-Watson" statistic, which examines the residuals (error terms) in a regression equation Interpretation of the Durbin-Watson statistic can be found in statistical and forecasting texts. Another method involves the determination of a serial correlation coefficient in testing the null hypothesis (H_0) that the population serial correlation coefficient (ρ) is equal to 0. This procedure requires the determination of a critical value for r (r_0) from a table, and subsequently calculating the two values for:

$$\pm r_0 \text{ -(1+(n-1))} \qquad \text{[Ref. 24: p. 254]}$$

where "n" is the number of observations in the sample, to depict the interval for testing the correlation coefficient (r) against the null hypothesis. If the value for the correlation coefficient (r) is contained in the interval

depicted by the two computed values, then the null hypothesis (H_0: $\rho=0$) may be accepted or one may state that the data does not support the existence of serial correlation.

The t-statistic can be used for testing certain hypotheses about the means of (assumed) normal distributions, such as whether the population correlation coefficient is equal to zero. The t-statistic can also be used to determine confidence intervals around the sample estimate for the population mean, such as the confidence that a coefficient of the regression equation is non-zero. If the test indicates that one cannot be confident that the coefficient is non-zero, the utility of the regression equation becomes questionable. In this thesis, a 95% confidence level will be required for rejection of the null hypothesis that any coefficient equals zero. The critical value from the t-distribution table for (n-2 = 16) degrees of freedom with a level of confidence of .95 is 2.12. A calculated t-statistic less than this will lead to acceptance (failure to reject) of the null hypothesis, whereas a value greater than 2.12 will lead to rejection (failure to accept) of the null hypothesis.

An F-test may be used to determine if one can be statistically confident about the strength of a relationship between variables. The computed F-ratio must be compared with the critical value determined from an F-table for 1 and 16 degrees of freedom at a .05 level of significance. This critical value is equal to 4.49. Interpretation of the

comparison is as follows: if the computed F-ratio is larger in magnitude than the critical value, then a significant linear relationship may exist between the variables or, one may reject (fail to accept) the null hypothesis that there is no significant linear relationship between variables; if the computed F-ratio is smaller in magnitude than the critical value from the F-table, then no significant relationship exists, or one may accept (fail to reject) the null hypothesis. The F-test and t-test on the regression coefficient are equivalent because the t-statistic is related to F (with one degree of freedom in the numerator) by: $t^2 = F$ [Ref. 21: p. 421].

The data sample for the Military Pay category was first examined through trend analysis. The results of the examination may be found in Appendix B, and are summarized in Table IV-1. A review of the coefficients of determination (r^2), and the correlation coefficients (r) indicated that very little variance in the data can be explained by the trend line.

The tests for serial correlation led to the general acceptance of the null hypothesis (H_0), that the population serial correlation coefficient was equal to zero. One exception was noted in the case of the USAREUR acceptance rate indicator, which strongly influenced the statistic for the Army-wide aggregate. This event will be examined in a subsequent section of this data examination. An interpretation of the overall results of the Durbin-Watson statistics,

TABLE IV-1

DATA EXAMINATION TESTS

	R^2 %	r	Serial Correlation $\pm r_0 - \frac{1}{n-1}$	Durbin-Watson	t-ratio cv=2.12	F-ratio cv=4.49
Acceptance Rate:						
Army-wide	15.2	.39	reject H_0	0.85	2.01	4.04
TRADOC	10.8	.33	accept H_0	0.99	1.75	3.06
FORSCOM	4.8	.22	accept H_0	2.23	1.36	1.86
USAREUR	21.0	.46	reject H_0	0.57	2.35	5.53
Army (s.a.)*	6.3	.25	accept H_0	0.98	0.97	0.94
Late Pay Change Rate:						
Army-wide	0.3	.06	accept H_0	1.78	1.03	1.06
TRADOC	1.2	.11	accept H_0	1.63	0.43	0.19
FORSCOM	1.4	.12	accept H_0	1.92	1.11	1.24
USAREUR	6.2	.25	accept H_0	1.45	1.46	2.12
Last Three Update Rate:						
Army-wide	11.0	.33	accept H_0	2.23	-1.69	2.36
TRADOC	12.5	.35	accept H_0	2.30	-1.77	3.15
FORSCOM	13.5	.37	accept H_0	2.17	-1.83	3.34
USAREUR	10.4	.32	accept H_0	2.11	-1.69	2.86

* Army-wide data with seasonal adjustment

disclosed that no serial correlation was likely to exist among the residuals with exceptions noted above. These exceptions indicated that positive serial correlation existed in the residuals of the acceptance rate data. In this case, the true underlying relationships among the variables is not expressed by the regression equation. The Durbin-Watson statistic for TRADOC indicated that serial correlation was questionable. (For the graphical interpretation of the critical regions of the Durbin-Watson statistic, the reader may refer to Appendix B.)

The examination of the t-statistics indicated that the null hypothesis (regression coefficient equals zero) would be accepted in all but one case, thus utilization of the regression equation is questionable. One may conclude that no statistically significant relationship exists between the variables (performance and time).

In the presence of serial correlation, one can frequently adjust the data sample to allow for a better fit to a linear regression line. Such adjustments are customarily made for suspected seasonality or cyclical movements in the data sample. Positive serial correlation was evident on an Army-wide basis for the acceptance rate indicator. The authors suspected that a seasonal pattern may have been evident, and subsequently reevaluated the data sample after adjustments were made for seasonality. The adjustments were made based on a "three-term" moving average adjustment for

seasonal variation [Ref. 24: p. 419]. The moving average adjustment for seasonality is a smoothing technique which may be used to minimize the effects of seasonal fluctuations in a time-series. The three-term moving average adjustment did not result in a significantly different Durbin-Watson statistic from the previous results for the Army-wide acceptance rate data sample, and therefore would not increase the confidence in the regression equation as a predictor of performance.

2. Tests for Assessing the Effectiveness of DA QA Assistance visits

One of the Director for Quality's major responsibilities is to provide on-site assistance to field FAOs as the need arises. Further examination of the data sample will test the effect of a DA QA assisstance visit on the performance of a FAO and the MACOM as a whole. It would be meaningful to USAFAC and MACOM decision makers to know whether or not performance as reflected in the critical data indicators generally improves after an assistance visit. This information allows USAFAC and MACOM managers to make better decisions about the allocation of its resources. Intuitively, one might expect improved performance immediately after an assistance visit, followed by a gradual decay in performance and a subsequent period of level performance at a level higher than prior to the DA QA assistance visit. Performance of this nature is exhibited in Figure IV-1.

INTUITIVE TRANS-VISIT PERFORMANCE PATTERN

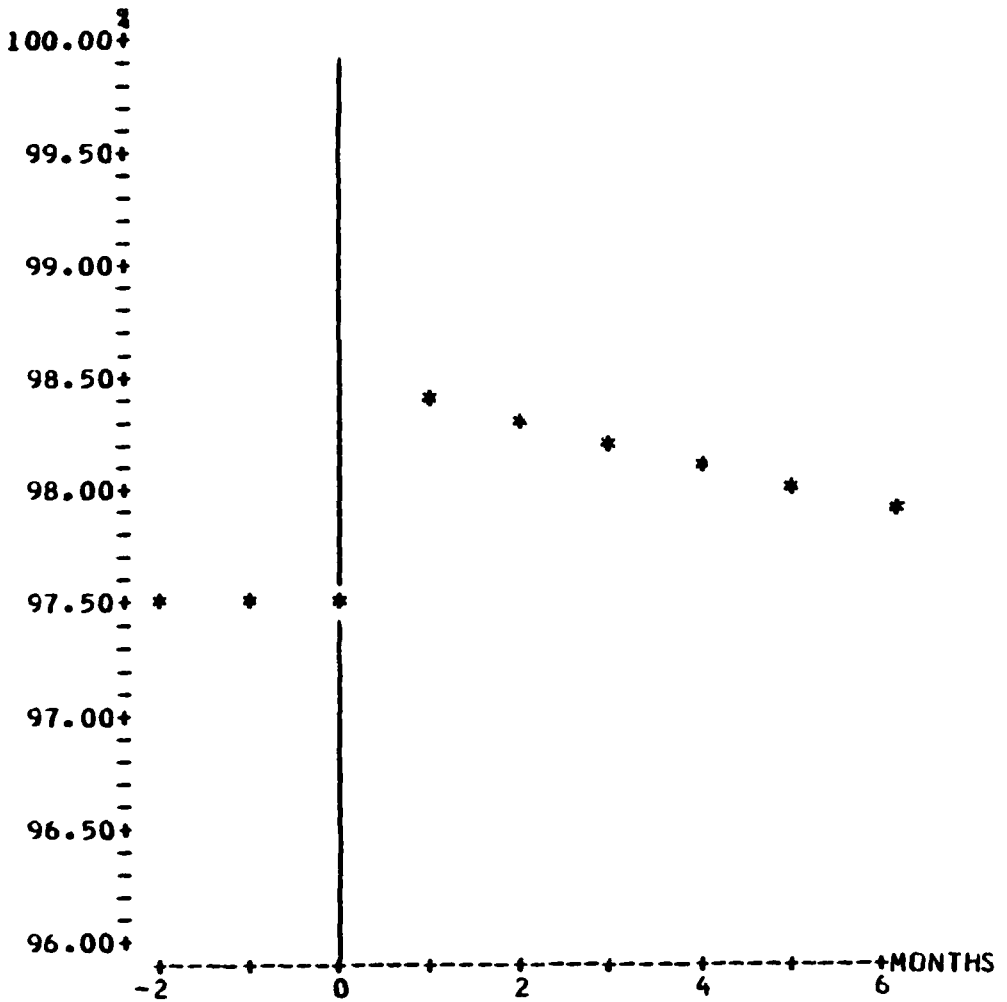

FIGURE IV-1

It should be emphasized that these tests do not constitute a classical statistical, controlled experiment to conclude whether or not an assistance visit significantly affects performance. If performance in one critical indicator shows little or no improvement after an assistance visit, then the assistance visit may not be beneficial to the FAO as far as improving the performance measured by that specific critical data indicator. However, it could still be that the assistance visits improve performance measured by other critical data indicators or improve FAO performance in some aspect not now measured by any critical indicator. Finally, the assistance visit may well prevent deterioration in, and help maintain the present high levels of, performance yet not show up in an immediate post-visit performance increase. In other words, the tests performed in this research for assistance visit effectiveness looked only for immediate, positive reaction to the visit in one critical indicator. If response to the visit was in other areas of performance, or was a long-term, gradual response rather than an immediate, abrupt response, or was non-negative rather than positive in nature, it would not be detected by the tests descibed in this thesis.

This section will discuss two tests which the authors conducted to assess whether the DA QA assistance visits to field FAOs had a significant effect on observed performance data. The first test compares the pre-visit and post-visit

FAO performance means. The second test subjectively compares the observed pre- and post-visit FAO performance pattern to the intuitively expected performance pattern of a FAO, before and after undergoing a DA QA assistance visit as shown in Figure IV-1.

a. Test #1

The first test for assessing the effectiveness of a DA QA assistance visit to field FAOs, attempts to identify statistically significant differences in the pre-visit and post-visit mean performances for the individual FAOs. The pre-visit mean is calculated from sample data available for two months prior to the DA QA assistance visit, in addition to the month of the assistance visit (three months total). The post-visit mean is calculated for the six month period subsequent to the month of the assistance visit.

If the DA QA assistance visits are in fact effective in improving the aspects of performance of field FAOs which are measured by critical data indicators, one might expect to observe a difference in the pre- and post-visit mean performances. Further, one might expect that post-visit mean performance would be better than the pre-visit mean performance. In statistical terms, the authors will refer to a situation where there is no difference between the pre- and post-visit mean performances as the "null hypothesis". The "alternate hypothesis" for the purposes of this test is the situation where the post-visit

performance mean is better than the pre-visit mean performance level.

The "Student's t" distribution allows for the use of a "t" test to determine the level of significance for the difference in means of two populations [Ref. 21: p. 208]. The "t" distribution involves using s, an estimate of the population variance, which is calculated from the sample. It is customary and acceptable to make the assumption that the variances are not the same for the pre- and post-visit means when the sample sizes are small, unless there is evidence to the contrary [Ref. 21: pp. 214]. The unequal variance assumption will provide the analyst with a more conservative analysis, a slightly larger confidence interval, and thus a lesser chance of rejecting a true null hypothesis [Ref. 3: p. 42]

The level of significance indicates the amount of confidence one has in rejecting the null hypothesis. If the "t" test is significant at the .05 level, one can reject the null hypothesis with 95% confidence, which means there is only a 5% chance (or less) that the null hypothesis would be rejected when in fact there was no difference in pre- and post-visit performance means. This test is one way by which the effectiveness of DA QA assistance visits to field FAOs can be assessed.

b. Test #2

The second test for assessing the effectiveness of DA QA assistance visits, consists of a graphical comparison of intuitive and actual performances of the MACOMs and all sampled FAOs after a DA QA assistance visit. The intuitive performance pattern is based on general knowledge of the authors' perceptions of human motivational principles and managerial intuition. The performance of each FAO may be compared with the intuitive pre- and post-visit performance (Figure IV-1) on an individual basis or on an aggregated basis for the MACOM. If the FAO's pre- and post-visit performance pattern is similar to that of the intuitive performance model, it may be deducted that the DA QA assistance visit was effective in improving the performance of the FAO. If pre- and post-visit performance does not display the pattern exhibited by the intuitive performance model, then the graphical analysis will not support any conclusions drawn to the relationship of FAO performance and the effectiveness of the DA QA assistance visits.

This method of comparison is subjective, may be less precise, and may contain "random fluctuation" in the data great enough to conceal actual improvements in FAO performance, and therefore, be difficult to apply practically. There is one distinct advantage to the graphical comparison of performance patterns, in that the subjective expertise gained by the analyst can be utilized in areas where quantifiable statistics fail to reveal any significance.

c. Test Evaluation

Analysis of data for the sample FAOs in the three MACOMs for the period January 1980 through June 1981 reflected the results discussed in the following sections. The acceptance rate critical data indicator was selected by the authors for these tests because it was felt to be the performance measurement most likely to have shown a change attributable to the DA QA assistance visits.

(1) Test #1. For the comparison of pre-visit and post-visit mean performance levels, TRADOC, FORSCOM and USAREUR sample FAO's pre- and post-visit performance means were calculated. This data is shown in columns two and three of Table IV-2, respectively The difference in the two means is shown in column four of Table IV-2. A positive number in this column indicates that the post-visit mean level of performance is higher than the pre-visit mean level of performance, whereas a negative number indicates that the pre-visit mean level of performance is higher. The t-statistic shown in Table IV-2 was calculated using the formula:

$$t = (\bar{x}_1 - \bar{x}_2) \div \sqrt{s_1^2/n_1 + s_2^2/n_2}$$

where $\bar{x}_1$ and $\bar{x}_2$ are the post- and pre-visit means respectively, s_1^2 and s_2^2 are the sample variances of the post- and pre-visit means, and n_1 and n_2 denote the post- and pre-visit sample sizes respectively. The degrees of freedom are based on the approximation:

TABLE IV-2

PRE-VISIT VS. POST-VISIT PERFORMANCE LEVELS

DSSN	PRE-VISIT MEAN	POST-VISIT MEAN	DIFFERENCE in MEANS	T stat.
TRADOC	98.49	98.65	0.16	1.04
5003	98.77	99.37	0.60	0.79
5009	97.45	97.50	0.05	0.05
5053	97.32	97.91	0.59	0.36
5056	98.45	98.58	0.13	0.25
5059	98.61	98.60	-0.01	-0.07
* 5074	99.25	99.51	0.26	1.96
6325	-	-	-	-
* 6339	98.15	98.86	0.71	3.43
6340	98.82	99.30	0.48	0.85
* 6343	98.59	99.00	0.46	2.29
6351	98.74	98.94	0.20	1.05
6360	-	-	-	-
6367	98.16	98.38	0.22	0.80
6380	98.00	98.43	0.43	1.46
6388	99.34	99.40	0.06	0.38
6392	-	-	-	-
0066	97.95	98.52	0.57	1.18
0068	-	-	-	-
USAREUR	97.49	97.15	-0.34	-0.87
5495	98.57	95.97	0.40	0.28
5499	98.20	99.13	0.93	1.43
5580	95.65	97.23	1.58	0.45
5581	97.97	97.67	-0.31	-0.40
5588	94.90	94.12	-0.78	-0.35
5589	98.07	96.93	-1.07	-1.64
6324	96.40	94.80	-1.60	-1.82
* 6333	95.40	97.29	1.89	3.13
6334	99.34	99.40	0.06	0.31
* 6335	97.50	98.72	1.22	2.91
6359	98.07	97.77	-0.30	-0.84
6387	97.93	98.47	0.53	1.28
6393	97.58	98.07	0.49	1.20
6458	97.49	97.97	0.48	0.93
6459	98.49	98.83	0.34	0.82
6545	98.11	97.83	-0.28	-0.38
6579	97.47	96.37	-1.10	-1.52
6583	97.27	97.29	0.02	0.05

* = improved performance @ 95% confidence level

TABLE IV-2

PRE-VISIT VS. POST-VISIT PERFORMANCE LEVELS

DSSN	PRE-VISIT MEAN	POST-VISIT MEAN	DIFFERENCE in MEANS	T stat.
FORSCOM	97.43	98.03	0.06	1.21
5002	97.93	-	-	-
5008	99.07	98.88	-0.19	-0.67
5058	-	-	-	-
5066	91.77	99.27	7.50	1.04
5071	98.20	98.30	0.10	0.31
5072	99.23	98.95	-0.28	-2.80
5073	96.77	98.33	1.56	1.11
5082	-	-	-	-
5086	98.30	98.08	-0.22	-0.33
5409	99.83	99.70	-0.13	-0.69
5486	96.47	96.13	-0.34	-0.41
5493	96.23	95.58	-0.65	-0.47
5579	96.73	97.66	0.93	1.16
6363	97.80	97.90	0.10	0.22
6383	98.60	98.73	0.13	0.51
6385	-	-	-	-
6396	-	-	-	-
6416	97.13	98.17	1.04	1.84

$$d.f. = \frac{[(s_1^2/n_1) + (s_2^2/n_2)]}{\frac{(s_1^2/n_1)^2}{(n_1-1)} + \frac{(s_2^2/n_2)^2}{(n_2-1)}}$$

from which critical t-values should be determined using a t-distribution table, for comparison to the above calculated t-statistic. [Ref. 3: pp. 141-142]

As previously stated, a 95% confidence level was used for rejection of the null hypothesis. At the 95% confidence level, three TRADOC FAOs (5074, 6339, and 6343) and two USAREUR FAOs (6333 and 6335) may be said to have improved performance attributable to the DA QA assistance visit. If the required confidence level for rejection of the null hypothesis were to be relaxed (i.e. 85%), the value of the t-statistic would be lesser in magnitude and consequently more FAOs could be considered to have improved performance attributable to the DA QA assistance visits. It may be of interest to note that the t-statistic of the MACOMs' composite data indicated that the null hypothesis may not be rejected at the 95% confidence level.

(2) Test #2. This test consisted of a graphical comparison of the pre- and post-visit performance of the MACOMs and individual sample FAOs to the "intuitive" model shown if Figure IV-1. This comparison allows one to identify FAOs in which improved performance may be reasonably attributed to the DA QA assistance visits. The performance patterns of the MACOMs and the FAOs identified in Test #1 as

having improved performance attributable to the DA QA assistance visits are portrayed in Figures IV-2 through IV-7. Additionally, one additional FAO's (DSSN 5538) pre-and post-visit performance pattern is shown in Figure IV-7 to illustrate a typical pattern for the many FAOs not identified by Test #1 as showing a response (note the scalar differences). It should be noted that this procedure of graphical comparison has some inherent caveats in its application. First, the critical data may practically be unchanged eventhough graphical portrayal of performance indicates some improvement. Second, the critical data indicator of JUMPS acceptance rate has very little practical room for improvement (i.e. how much better than 98% acceptance can one reasonably expect?).

The graphical comparison of pre- versus post-visit performances does not support the conclusion that post-visit performance is improved over pre-visit performance.

3. Summary of Data Evaluation

The examination of the sample data has consisted of various statistical tests which have described the data sample sufficiently for the authors to justify a lack of confidence in the application of regression methods of analysis as a measurement of performance. It may be more appropriate in the analysis of time-series data to evaluate the sample by methods described in texts as "moving averages" and "exponential smoothing".

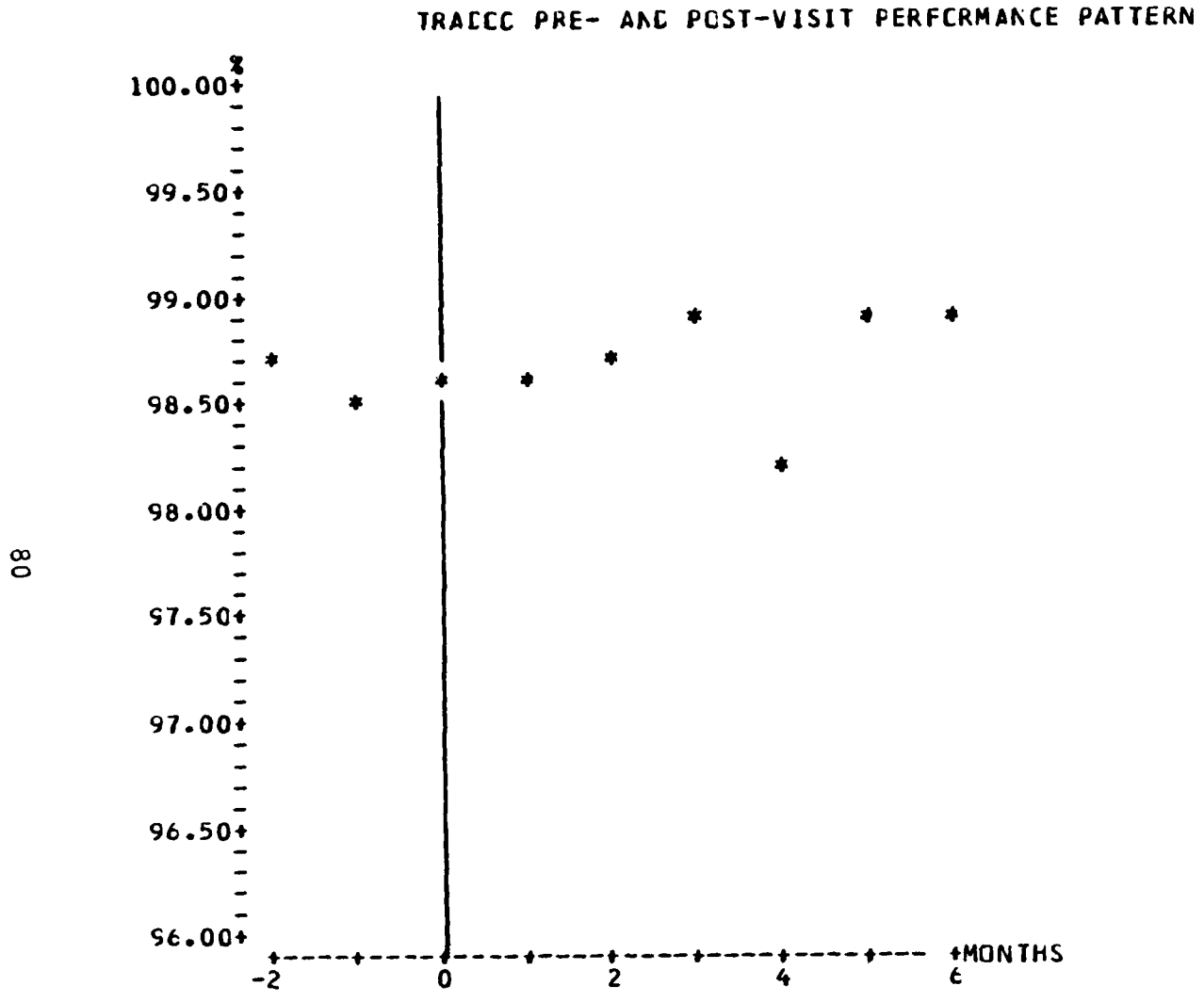
TRACCC PRE- AND POST-VISIT PERFORMANCE PATTERN
%
100.00
99.50
99.00
98.50
98.00
97.50
97.00
96.50
96.00
80
-2
0
2
4
6
MONTHS

FIGURE IV-2

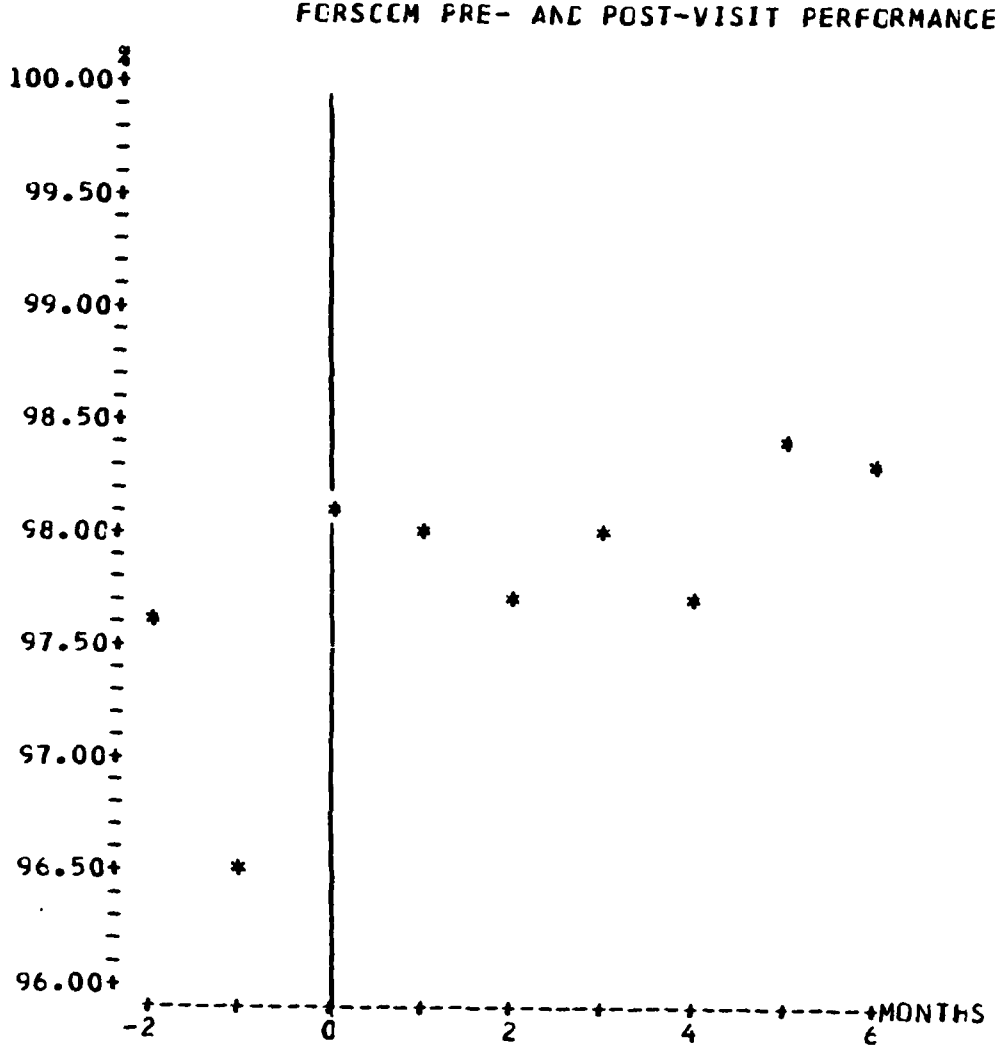
FORSCOM PRE- AND POST-VISIT PERFORMANCE PATTERN
%
100.00
99.50
99.00
98.50
98.00
97.50
97.00
96.50
96.00
-2
0
2
4
6
MONTHS

FIGURE IV-3

USARELR PRE- AND POST-VISIT PERFORMANCE PATTERN

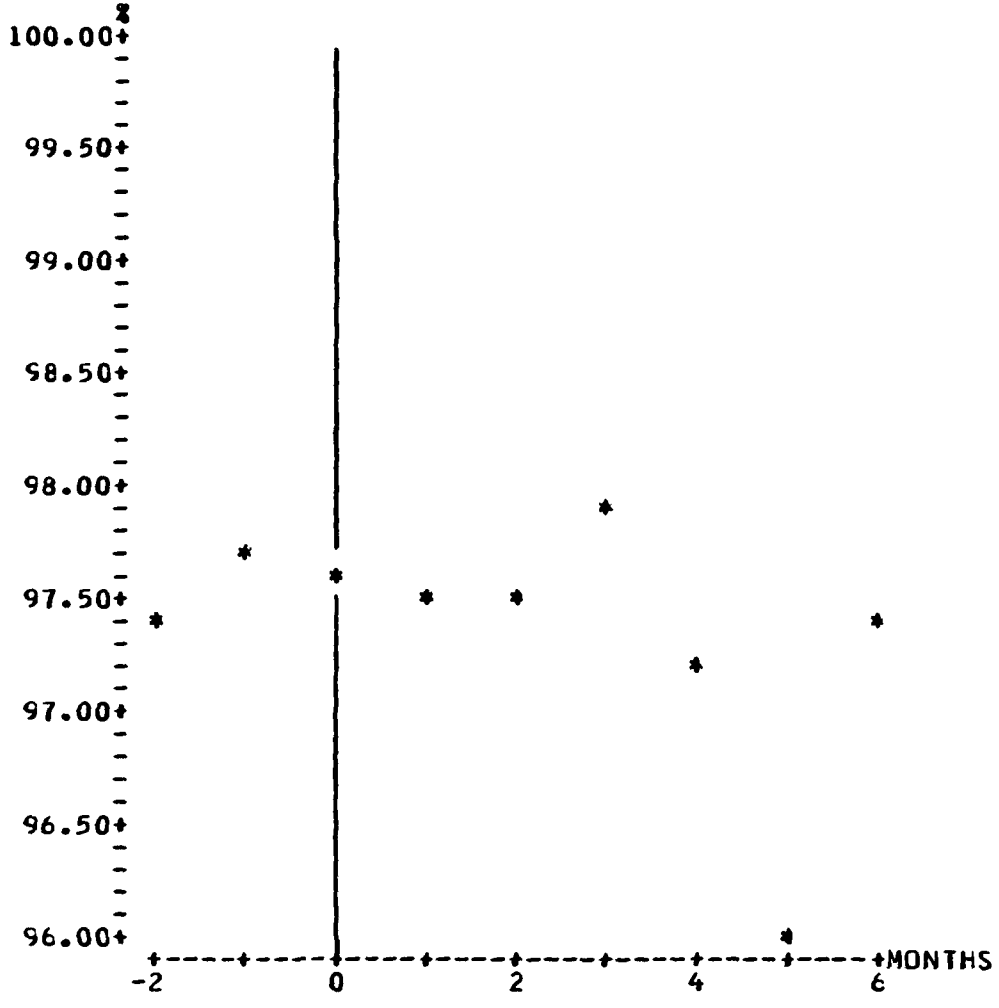

FIGURE IV-4

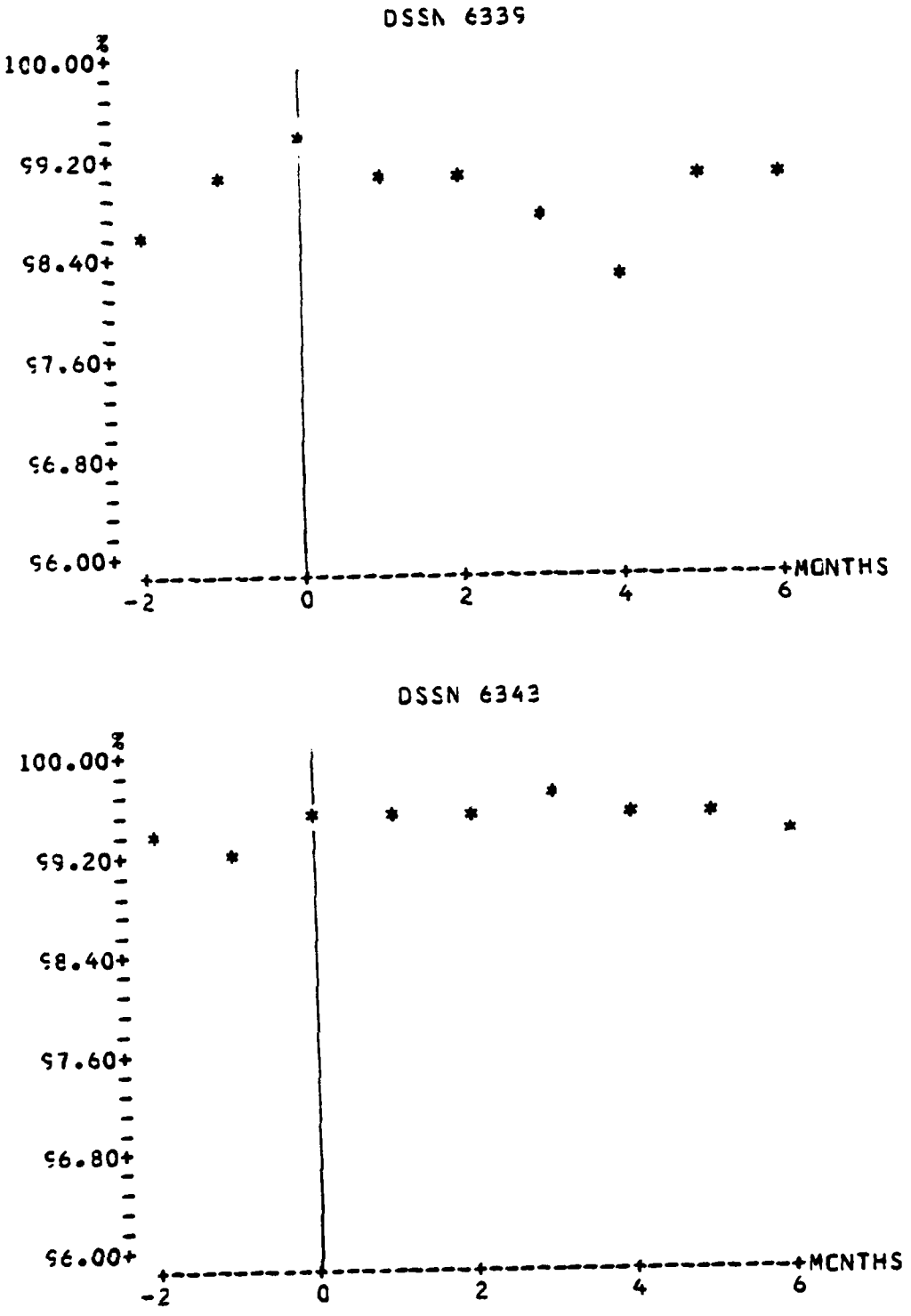
DSSN 6339
%
100.00
99.20
98.40
97.60
96.80
96.00
MONTHS
-2
0
2
4
6
DSSN 6343
%
100.00
99.20
98.40
97.60
96.80
96.00
MONTHS
-2
0
2
4
6

FIGURE IV-5

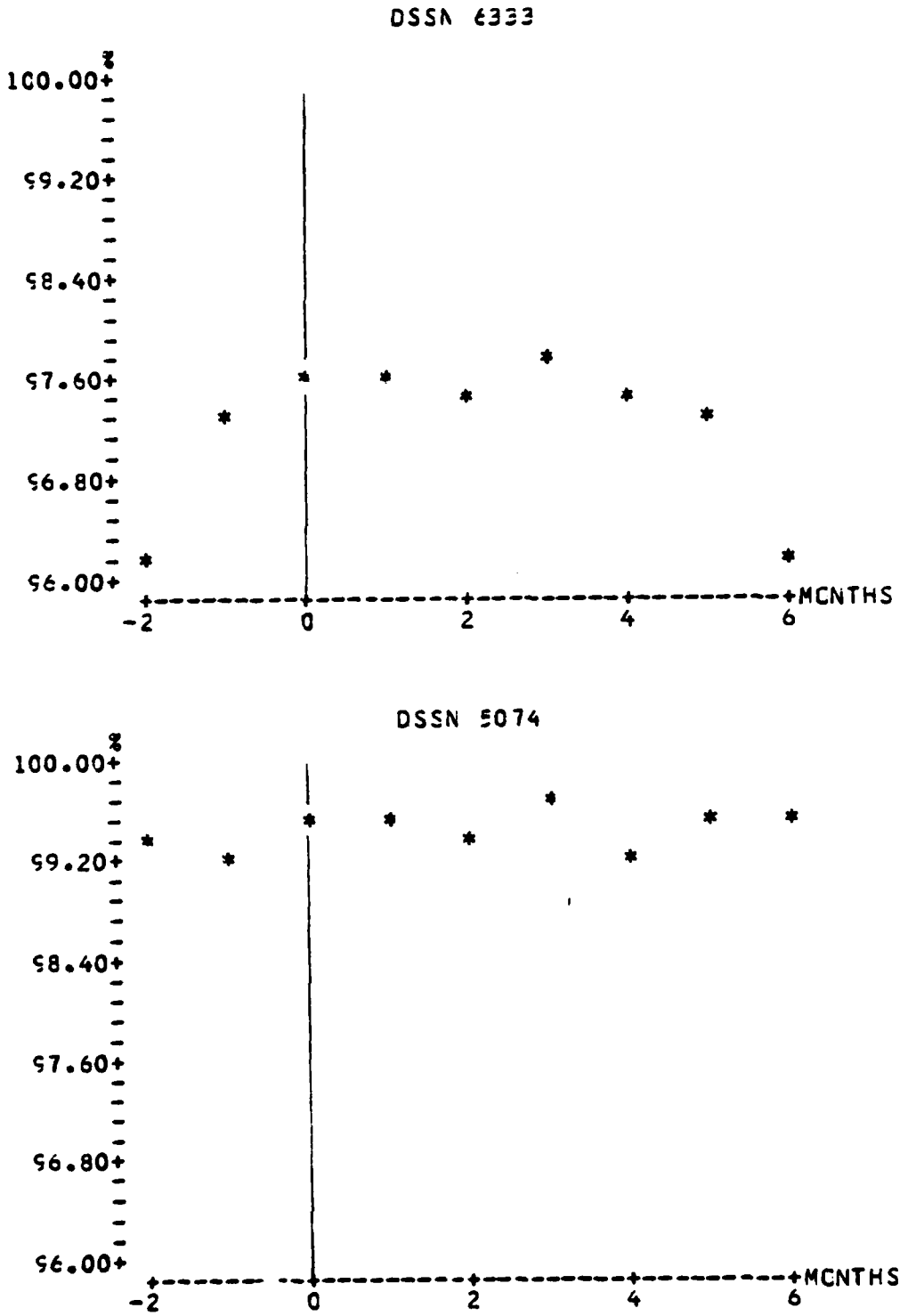
DSSN 6333
%
100.00+
99.20+
98.40+
97.60+
96.80+
96.00+
-2
0
2
4
6
MONTHS
DSSN 5074
%
100.00+
99.20+
98.40+
97.60+
96.80+
96.00+
-2
0
2
4
6
MONTHS

FIGURE IV-6

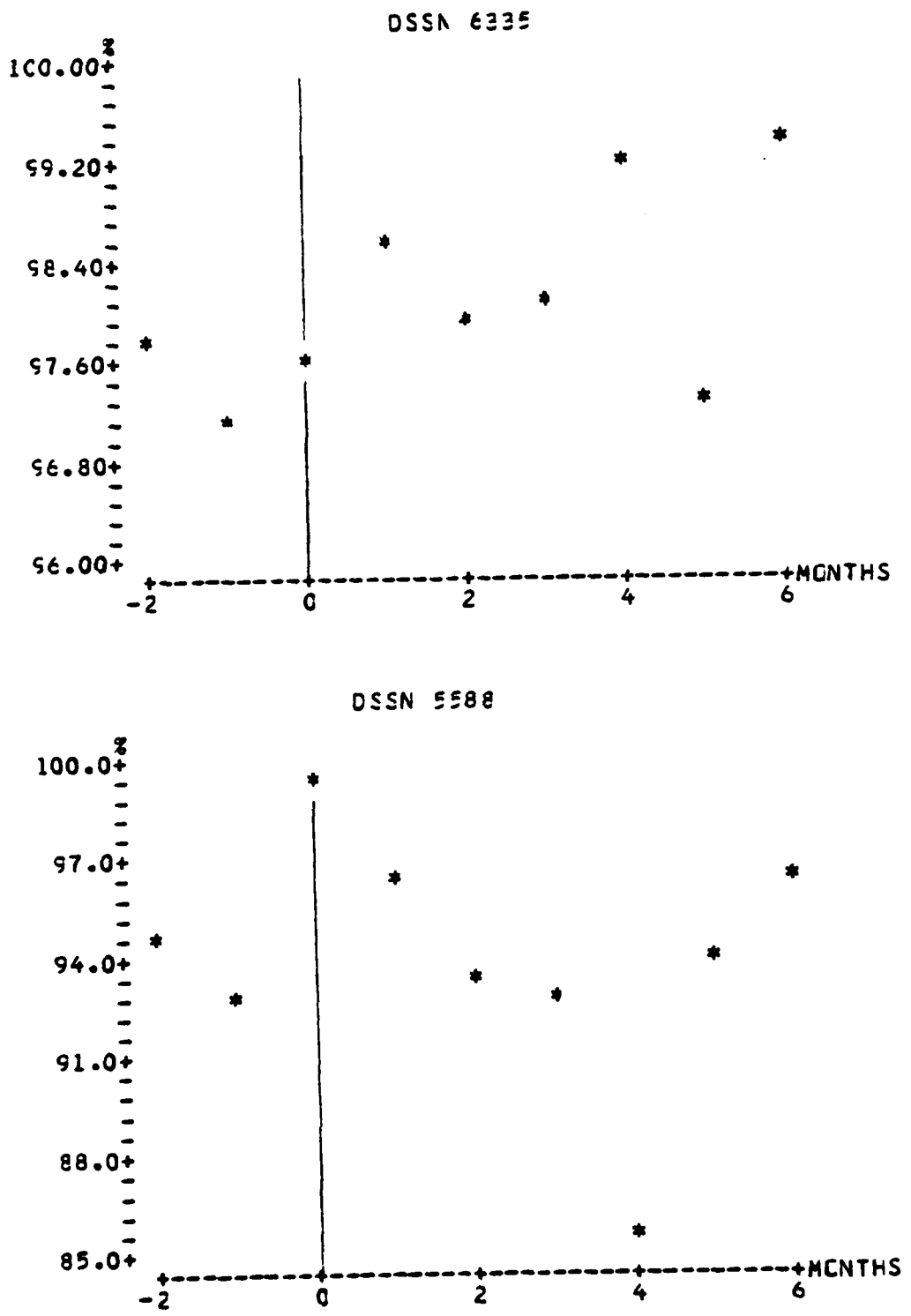
DSSN 6335
%
100.00+
99.20+
98.40+
97.60+
96.80+
96.00+
-2
0
2
4
6
MONTHS
DSSN 5588
%
100.0+
97.0+
94.0+
91.0+
88.0+
85.0+
-2
0
2
4
6
MONTHS

FIGURE IV-7

Moving averages and exponential smoothing techniques generally require less data than regression methods, and computations can be revised rather quickly upon collection of new data points as time progresses. Among the advantages of these two methods are that they are easy to understand and calculate and they have minimal data storage requirements.

The moving average method of analysis of time-series data is often used due to the advantages previously stated. A moving average is simply the numerical average of the last "N" data points (e.g. last 18 months) which are used in making a forecast or setting a performance standard. As the name, moving average, implies, successive averages are computed while moving along in a time-series. A moving average is a smoothing method for reducing the effects of erratic and short-term movements in a time-series. However, by restricting the computation to the N most recent points, one can predetermine the desired response to data changes. The number of terms used in a moving average will determine the degree of smoothness or the responsiveness to movements. It is of interest to note that moving average techniques were widely used by the Air Force in the CHECKPOINTS program, desribed in Chapter II.

Exponential smoothing techniques place more emphasis (weight) on current data and less on data of the distant past. The emphasis is applied through the use of a smoothing constant (α) which weights the data points by a calculation

of a mathematical equation. The α term in exponential smoothing and the "N" term in a moving average method act similarly, because a large α and a small N both place the higher importance (emphasis) on current data.

The moving average technique was selected by the authors, due to its ease of computation and wide usage in the Air Force, for developing a methodology for measuring current FAO performance and determining the current network profile to be presented in the next section of this chapter.

D. METHODOLOGIES FOR PERFORMANCE ANALYSIS

The analyses described in this section have two primary objectives. The first is to develop methodologies for identifying substandard performance by an individual FAO. The second is to develop a methodology which will enable the Director for Quality, USAFAC, to assess the current health of the DA financial network. For the purposes of the remaining sections of this chapter and the recommendations and conclusions presented in Chapter V, the term "substandard" will generally refer to a FAO's frequent appearance in the bottom quartile of performances within the MACOM (different interpretations of "substandard" are used in sections D.2.c and D.3 of this chapter). By definition, since the procedures utilized in two of the alternatives are essentially ones which involve performance ranking, a bottom quartile will always exist. Occasional appearance in the bottom quartile

may be purely random and not due to any real deficiency, however habitual appearance in the bottom quartile would support the non-random point of view and identify the FAO as "substandard". The habituallity of appearance in the bottom quartile on an operational basis will be the focus of the following section. It should also be noted that substandardness is dynamic in that a FAO may be identified as substandard during one period and may perform superbly subsequent to the identification as a substandard performing FAO. It is recognized by the authors that in order for substandardness to exist, a standard should first be established, however the above stated definition will suffice for this research.

1. Establishing the Existence of a Substandard Condition

In order to develop a methodology for identifying substandard performance of DA FAOs, the existence of a substandard condition should first be established. Prior to being able to identify an individual FAO as a substandard performer, one must first answer the question; is appearance in the bottom quartile simply an independent random event, or is there a pattern of substandard performance at least for some FAOs? If the performance of an individual FAO is statistically independent from month to month, then the performance in one month is not in any way related to the performance of any previous month [Ref. 21: p. 62].

For the following analysis, FAO performance will be rank ordered for each of the 18 months in the period January

1980 - June 1981. The five lowest performing FAOs will be identified on a monthly basis. (Five FAOs correspond to approximately the bottom quartile of the sample taken from each MACOM.) If appearance in the bottom quartile is an independent random event with constant probability of occurence for all FAOs, for all months, then this event (appearance in the bottom quartile) could be described as a binomially distributed random variable.

The binomial distribution is a discrete distribution of a variable which is either a success or a failure. One should envision "n" independent "trials", each resulting in either "success" or "failure", with respective probabilities (1-p) and p. The total number of failures, x, is then a binomial random variable. The binomial probability distribution has the distribution function:

$$P(x) = \binom{n}{x} p^x (1-p)^{n-x}$$ [Ref. 21: p. 102]

The outcomes are required to be either "successes" or "failures". In this thesis, "failure" is represented by a FAO appearing in the bottom quartile for any particular month. Independence and constant probability of failure must be assumed for FAO performance from one month to the next for the binomial distribution to hold. If FAO performance is found to behave significantly differently from that predicted by the binomial distribution, the assumption of independence or constant probability (or both) must be rejected; in other

words, there is non-randomness present and the conditions the authors have called "substandard performance" exists for some FAOs.

The complimentary cumulative probability distribution (Table IV-3 third column) lists the probability any particular FAO will appear in the bottom quartile more than K times out of 18 if the event behaves binomially. For example, the probability of a particular FAO appearing in the bottom quartile more than ten times is equal to .0031, thus this would be a highly unlikely event. Similarly, a FAO should appear in the bottom quartile more than seven times out of 18 with a probability of .0975 or roughly 10%. When an individual FAO appears in the bottom quartile eight or more times, the hypothesis that this event is an independent random occurence for that FAO can be rejected with 90% confidence. Thus a significant dependent relationship would exists between current and past relatively poor performance for that particular FAO.

To validate the definition of substandardness the authors used historical data from the period January 1980 - June 1981 for the two MACOMs: TRADOC and USAREUR. These two MACOMs were selected based on the analyses of the data sample which indicated that TRADOC FAO sample data and USAREUR FAO sample data would provide the least and most variance in performance results, respectively. Tables IV-4 and IV-5, sections A, list the bottom quartiles for FAOs within TRADOC

TABLE IV-3

BINOMIAL PROBABILITY DISTRIBUTION

(N = 18)

K	P (X = K)	P (X > K)
0	.0029	.9971
1	.0198	.9774
2	.0647	.9127
3	.1327	.7800
4	.1914	.5886
5	.2061	.3825
6	.1718	.2107
7	.1132	.0975
8	.0599	.0376
9	.0256	.0120
10	.0089	.0031
11	.0025	.0007
12	.0006	.0001
13	.0001	.0000

TABLE IV-4

A. TRADOC'S BOTTOM QUARTILE BY MONTH

JAN 80	FEB 80	MAR 80	APR 80	MAY 80	JUN 80
5009	6392	0066	5003	6392	5059
6392	6325	6392	6392	5009	5009
6339	6380	6380	0066	6343	6340
6380	5009	6360	5056	6351	6360
5059	6339	6367	5009	6367	5056

JUL 80	AUG 80	SEP 80	OCT 80	NOV 80	DEC 80
5056	0066	6367	5053	5009	5009
6392	5056	5056	6367	5056	5053
5053	6392	6392	6392	6340	6360
6367	5009	5059	5009	5059	6367
5009	6339	6340	6360	5053	6392

JAN 81	FEB 81	MAR 81	APR 81	MAY 81	JUN 81
5009	5009	6380	5009	6392	0066
5053	6367	5053	6392	6380	6380
0066	5053	5009	6367	5009	6367
5059	6380	6392	5053	6360	6392
6380	5059	5059	6351	0066	6339

B. TRADOC DSSNS TALLIED ACCORDING TO NUMBER OF TIMES OF APPEARANCE IN THE BOTTOM QUARTILE

DSSN	NUMBER		PROBABILITY
5009	15		0.0000
6392	14		0.0000
6367	9	SS	0.0376
5053	8		0.0975
6380	8		0.0975
5059	7		0.2107
5056	6		0.3825
6360	5	MS	0.5886
0066	5		0.5886
6339	4		0.7800
6340	3		0.9127
6351	2		0.9774
5003	1		0.9971
6325	1	NS	0.9971
6343	1		0.9971
0068	1		0.9971
5074	0		1.0000
6338	0		1.0000

TABLE IV-5

A. USARELR'S BOTTOM QUARTILE BY MONTH

JAN 80	FEB 80	MAR 80	APR 80	MAY 80	JUN 80
5580	5580	5495	6583	6583	5495
6333	5588	5588	5580	5588	5588
5589	6333	5580	6393	5495	6579
5495	5499	5581	6359	5580	6324
5588	6324	6324	6333	6333	5589

JUL 80	AUG 80	SEP 80	OCT 80	NOV 80	DEC 80
5588	5588	5588	6545	5588	6359
5495	6324	6458	5495	5495	5495
6324	5495	6324	6324	6324	6579
6579	6458	5589	6333	6579	5588
5580	6579	6333	5588	6359	6387

JAN 81	FEB 81	MAR 81	APR 81	MAY 81	JUN 81
5588	5588	6324	6324	5495	6579
6579	6324	6579	5588	6579	5581
5495	6583	6459	5585	6324	6583
6333	6579	6393	5495	5580	6324
6583	6393	5588	6579	5588	5588

B. USAREUR DSSNS TALLIED ACCORDING TO NUMBER OF TIMES OF APPEARANCE IN BOTTOM QUARTILE

DSSN	NUMBER		PROBABILITY
5588	17		0.0000
6324	13		0.0001
5495	11	SS	0.0031
6579	11		0.0031
5580	7		0.2107
6333	7	MS	0.2107
6583	5		0.5886
5585	4		0.7800
6359	3		0.9127
6393	3		0.9127
5499	2		0.9774
5581	2		0.9774
6458	2		0.9774
6387	1	NS	0.9971
6455	1		0.9971
6545	1		0.9971
6334	0		1.0000
6335	0		1.0000

and USAREUR respectively, by month. Sections B, of the above tables, list the total number of times and the associated probability that each FAO appeared in the bottom quartile.

Sections B of Tables IV-4 and IV-5 further indicate categories which depict the significance or "degree" of substandardness. For example, appearance in the bottom quartile eight or more times may be termed "significantly substandard (SS)" because of the probability of occurence of 10% or less. The contrary may be said of the FAOs appearing in the bottom quartile three or fewer times, termed "not substandard (NS)", whereas the performance of FAOs appearing in the middle of the distribution may be termed "marginally substandard (MS)". The MS FAOs may qualify as either SS or NS in subsequent evaluations of the tests as time progresses. The fact that five and four FAOs appeared in the bottom quartile eight or more times for TRADOC and USAREUR respectively, is support for the rejection of the random hypothesis at the 90% confidence level for these FAOs. One may therefore state that substandardness, as defined by the authors, exists for this critical data indicator.

2. Identification of Substandard Performance

Now that the existence of relative "substandard" performance has been established it is possible to develop alternative methods for operationally identifying which FAOs are substandard performers. "Substandardness" in the preceding section was identified by examining what amounted to the

entire past history of the critical data indicator for the sample data. Such a procedure would be of little operational usefulness. The Director for Quality, USAFAC would probably have much less interest in finding out who has been substandard from the perspective of the past few years, than finding out who is substandard now. Still, as was seen for the majority of FAOs in the analysis in the last section, mere appearance in the bottom quartile in the most recent month is often not a reliable indication this condition will persist. The identification of the FAO on a timely basis would be of interest. This thesis will address three alternative methods for doing this. Two alternatives are based on the binomial probabiliby distribution, whereas the third is a graphical analysis of cumulative performance.

a. Alternative #I-1

The first alternative method identifies as substandard performers, all FAOs which appear in the bottom quartile four or more times during any consecutive six month period. The six month time period was judged by the authors to be a viable timeframe for allowing relatively quick identification of a substandard FAO. This period could be lengthened or shortened depending on the desired degree of responsiveness to random fluctuation. If a FAO appears in the bottom quartile four or more times during any six month period, then from the complimentary cumulative density for six trials it can be stated with 95% confidence that the

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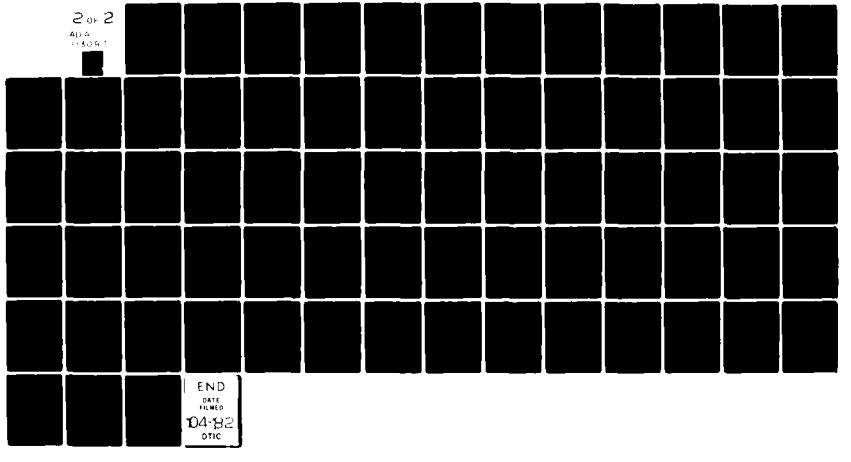
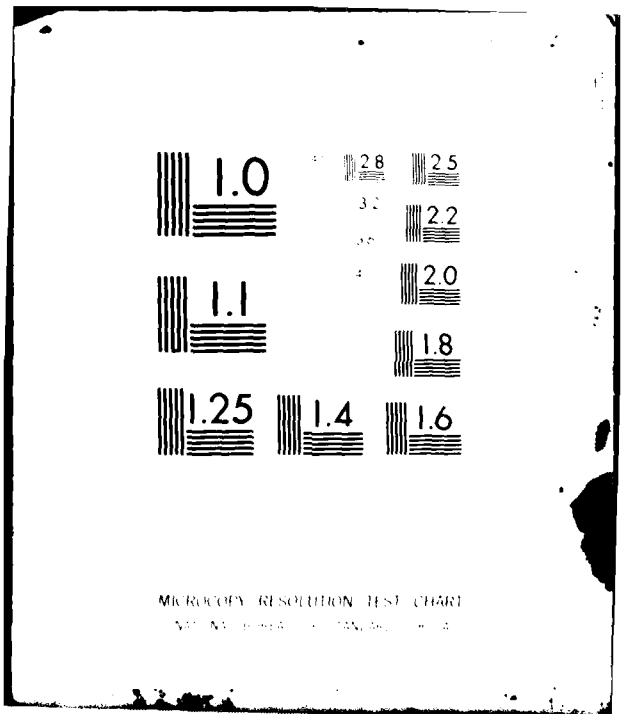



1.0
2.8
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6
MICROCOPY RESOLUTION TEST CHART

performance of that FAO is not due to random chance. The table below shows other possible combinations of trials and failures for which the complimentary cumulative density most closely approximates the 95% confidence level.

N	K	Pr. %
2	2	(60.0)
3	2	(83.3)
4	3	(93.8)
5	4	(97.9)
6	4	(95.3)
8	5	(96.5)
9	5	(94.3)
12	6	(94.0)
18	8	(94.0)

b. Alternative #I-2

The second alternative method identifies as substandard all FAOs which appear in the bottom quartile for three or more consecutive months. For a binomially distributed random variable with a probability of failure of 0.28, a run of three successive failures has less than a 2% chance of occurence, therefore, it can be stated with 98% confidence that the relative poor performance of a FAO is not random if it appears in the bottom quartile for three consecutive months. This method has the advantage of being able to identify some substandard performers in a quite short time frame. It should be especially effective in rapid identification of those operations which are experiencing a rapid decay of performance.

c. Alternative #I-3

The third alternative method of identifying substandard FAO performance is a graphical analysis of the

performance of each FAO over some period to compare its performance with other FAOs as well as the composite MACOM's performance. This approach does not depend on the assumptions of a binomial distribution for appearance in the bottom quartile, or even on the concept of a monthly ranking of FAOs. The preceeding two approaches, and indeed, the authors' definition of "substandardness", looked at habitually poor performance in terms of an ordinal ranking. "Bad" was defined in terms of that ranking, but ignored the question of "how bad". By contrast, this third method ignores the number of times a FAO is "bad" and concentrates on "how bad". A FAO which is not "bad" very often but when it is, is very very "bad" could not be detected by either of the prior two methods; it may be detected by this method. This method addresses the question: do we believe that the mean performances of the FAOs and the MACOM composite performance are statistically different?

This method of presentation is based on a statistical concept known as "Scheffe's multiple comparisons", which utilizes simultaneous confidence intervals for all FAOs. A normal distribution of the observed sample mean about the true mean will be assumed, as is customary [Ref. 21: p. 151]. The comparisons involve the computation and utilization of the pooled standard deviation of the performance data of the FAOs being compared. The pooled standard deviation and the uniform sample size insure that

all confidence intervals are of equal width. An example of this approach can be seen in Figure IV-8. This figure identifies the FAO by DSSN or the MACOM (column 1), the FAO's or MACOM's performance mean (column 2), and graphically displays the 95% confidence interval about its FAO's or MACOM's performance mean (to the right of column 2). Interpretation of the graphical portion of Figure IV-8 is as follows:

1. The FAO's performance mean is depicted by the "I" in the middle of the shaded region.
2. The shaded region depicted by "*********" represents the 95% confidence interval about the performance mean.
3. The upper and lower bounds of the 95% confidence interval are indicated by the "I"s at both ends of the interval.

If the mean of one FAO is not overlapped by the shaded region of the second FAO, it can be stated that a statistically discernible difference exists between the two FAOs' performance means. The same comparisons can be made between a FAO and the MACOM. An example of the preceeding performance interpretation is clearly reflected in Figure IV-8, between the performance means of FAO A and FAO C. There is no overlap between the mean of FAO A and the confidence interval of FAO C, which means that there <u>is</u> a statistically discernible difference between the performances of FAOs A and C.

This method may be applied for shorter period (i.e. 6 or 9 months) for a more responsive assessment of substandard performance, or for a longer period (i.e. 12, 18, or 24

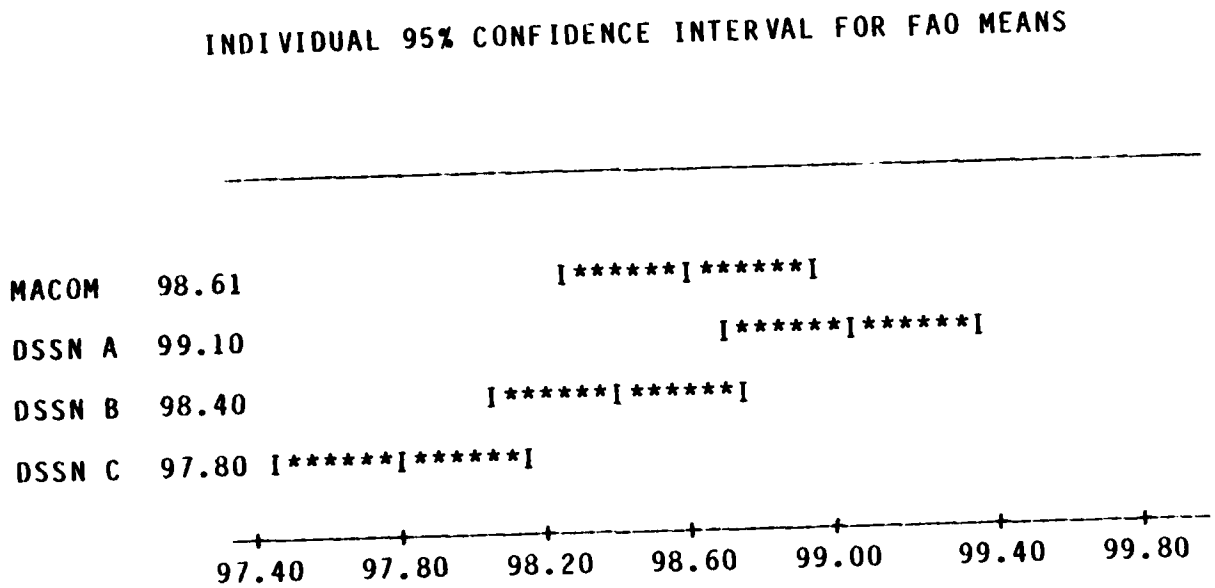

INDIVIDUAL 95% CONFIDENCE INTERVAL FOR FAO MEANS
MACOM 98.61
DSSN A 99.10
DSSN B 98.40
DSSN C 97.80
97.40
97.80
98.20
98.60
99.00
99.40
99.80

FIGURE IV-8

months) for smoother assessments of performance. The authors recommend an 18 month moving average, as that provides a viable mixture of responsiveness to and smoothing of short-term movements in the data sample. This information would be valuable to decision makers in that it would provide an easily understood method for identifying FAOs whose mean performances over the period of comparison are significantly below the period mean performance level of their MACOM.

3. Development of a Current Network Profile

The preceeding sections of this chapter addressed methodologies for identifying substandard performance by an individual FAO. This section will present a method which will enable the Director for Quality, USAFAC, to assess the current "health" of the DA financial network.

The term "health" will be used to describe the overall condition of the FAOs' composite performance in the period analyzed. The "health" of the DA financial network may be ascertained by the Director for Quality after the assessment of the FAOs and MACOMs overall composite performance in terms of an established standard of performance for any or all of the functional categories. Composite performance above (better than) or on the same level as an established performance standard will result in the assessment of the DA or MACOM financial network as "relatively healthy", whereas performance below (worse than) an established performance standard would lead to the assessment of an "relatively unhealthy" network.

Quality assurance can be thought of as a method for providing protection against a disaster. As stated by J. M. Juran in his book Quality Planning and Analysis, "the protection consists of information. This information serves one of two purposes: a. To assure the recipient that all is well ... the process is behaving normally ... the procedures are being followed; b. To provide the recipient with early warning that all is not well and that some disaster may be in the making. Through this early warning system, the recipient is placed in a position to take preventative action to avert a disaster." [Ref. 7: p. 516]

According to J. M. Juran, the appropriate type of standard for the comparison of performance data, is the "historical" standard [Ref. 7: pp. 518-525]. The historical standard can be used to answer the question: are we getting better or worse? The methodology used in this analysis for the development of the MACOM "historical" standards consisted of obtaining the mean performances from the 18 months of historical data (January 1980 - June 1981) for three of the critical data indicators in the Military Pay category. Historical standards suggested by this thesis are based on the moving average method, and are derived by computing the numerical average (mean) of the last N data points (e.g. 18 months). A brief discussion of moving averages and the rationale for basing the standard on a moving average was provided in section C.3 of this chapter.

This section addresses a methodology for identifying changes in overall composite performance through the development of a MACOM performance profile as a standard of performance and subsequently the graphical comparison of the current month's performance to this standard .

The term "current" for this analysis will be the period of time as of the latest (most recent) month for which data was reported and available, to the authors. This meant: as of June 1981.

A graphical presentation of the FAOs' current month performances can be compared with the most recent 18 month historical performance mean developed for the MACOM. Since only 18 months of data were available, the authors compared the current month to the previous 17 months' performance means. The interpretation of the composite graphical presentation is the same as the interpretation provided for Figure IV-8, and is also based on Scheffe's multiple comparisons of simultaneous confidence intervals.

E. METHODOLOGY EVALUATION

This section will present an analysis of the test data described in section B of this chapter using the methodologies developed in section D of this chapter. The purpose of this analysis is to provide some assessment of the validity and the usefulness of the methodologies developed for identifying substandard performance of field FAOs and assessing the current health of the DA financial network.

1. Analysis of Methodologies for Identifying Substandard Performance of DA FAOs

Three alternative methods were descibed in section D.2 of this chapter for identifying substandard performance of field FAOs. Data analysis for each alternative method will be presented separately within this section. Tables IV-4 and IV-5 addressed substandard performances by FAOs within their MACOMs for the 18 month test period. Two FAOs within TRADOC, DSSNs 5009 and 6392, appeared in the lowest quartile 15 and 14 times, respectively, during the test period. Additionally, two FAOs within USAREUR, DSSNs 5588 and 6324, appeared in the bottom quartile 17 and 13 times respectively. The probability that this could have happened due to random chance is essentially zero in all cases. Clearly, these would be considered "substandard" performers within their respective MACOMs for the 18 month test period of analysis. Besides these four FAOs, five additional FAOs were identified as being substandard with 90% confidence. These FAOs were identified as "significantly substandard (SS)" in Tables IV-4 and IV-5. This appearance in the bottom quartile an excessive number of times was taken as a definition of substandard performance for the purposes of this research. The relative performance of each of the three alternatives described for operational identification of substandard performance will be described below in terms of how accurately the alternatives identified these nine

relatively poor performers and how soon the alternative made the identification.

a. Alternative #I-1

As described earlier, this alternative identifies as substandard any FAO which appeared in the bottom quartile four or more times during any consecutive six month period. Using this criterion, TRADOC had seven FAOs qualify to be identified as substandard performers during the 18 month test period. Six USAREUR FAOs qualified to be identified as substandard performers during the 18 month test period. These FAOs are annotated in Table IV-6 in accordance with the previous identification of SS, MS, or NS categories to compare the results of the alternative with the cumulative binomial probability categorization of section D.1 This comparison will determine if the FAOs were accurately identified as substandard. Alternative #I-1 resulted in the correct identification of all nine of the "SS" categorized FAOs. This alternative also identified four "MS" categorized FAOs as substandard. It is noteworthy that three of the "MS" FAOs appeared in the bottom quartile seven times, and one FAO appeared in the bottom quartile six times. In other words, these FAOs were in the bottom of the "MS" category. This alternative requires a minimum of six months to determine substandardness, therefore, the months of detection range from 6 to 18 months. The results of this alternative are summarized in Table IV-6.

TABLE IV-6

IDENTIFICATION OF SUBSTANDARD PERFORMERS

DSSN		ALT. #1		ALT. #2		ALT. #3	
TRADOC							
5003	NS	-		-		-	
5009	SS	YES	6 *	YES	6	YES	18
5053	SS	YES	12	YES	12	YES	18
5056	MS	YES	8	YES	8	-	
5059	MS	YES	14	YES	15	-	
5074	NS	-		-		-	
6325	NS	-		-		-	
6339	MS	-		-		-	
6340	MS	-		-		-	
6343	NS	-		-		-	
6351	NS	-		-		-	
6360	MS	-		-		-	
6367	SS	YES	10	YES	10	-	
6380	SS	YES	17	YES	3	-	
6388	NS	-		-		-	
6392	SS	YES	6	YES	3	YES	18
0066	MS	-		-		-	
0068	NS	-		-		-	
USAREUR							
5495	SS	YES	6	YES	7	YES	18
5499	NS	-		-		-	
5580	MS	YES	6	YES	3	YES	18
5581	NS	-		-		-	
5588	SS	YES	6	YES	3	YES	18
5589	MS	-		-		-	
6324	SS	YES	7	YES	8	YES	18
6333	MS	YES	6	-		-	
6334	NS	-		-		-	
6335	NS	-		-		-	
6359	NS	-		-		-	
6387	NS	-		-		-	
6393	MS	-		-		-	
6458	NS	-		-		-	
6459	NS	-		-		-	
6545	NS	-		-		-	
6579	SS	YES	11	YES	8	-	
6583	MS	-		-		-	

* denotes the month of detection as a substandard FAO

b. Alternative #I-2

This alternative identified as substandard performers any FAO which appeared in the bottom quartile for three consecutive months. Using this criterion, TRADOC had seven and USAREUR had five FAOs identified as substandard performers during the 18 month test period by Alternative #I-2. The comparison with the previously identified categories of SS, MS, and NS resulted in the correct identification of all nine of the "SS" categorized FAOs. This method also identified three "MS" categorized FAOs as substandard, two with seven and one with six appearances in the bottom quartile. This alternative can identify substandardness in a three month period, therefore the month of detection can range from 3 to 18 months. Results for TRADOC and USAREUR are summarized in Table IV-6.

c. Alternative #1-3

This alternative identified as a substandard performer any FAO whose mean performance level for the 18 month test period, was significantly below the MACOM composite mean level of performance based on Scheffe's multiple comparisons concept. TRADOC had three FAOs, those with DSSNs; 5009, 5053, and 6392, qualify to be identified as substandard performers by this alternative. The TRADOC performances are graphically presented in Figure IV-9. Note that there is no overlap between the performance means of the three substandard FAOs and the 95% confidence interval of the

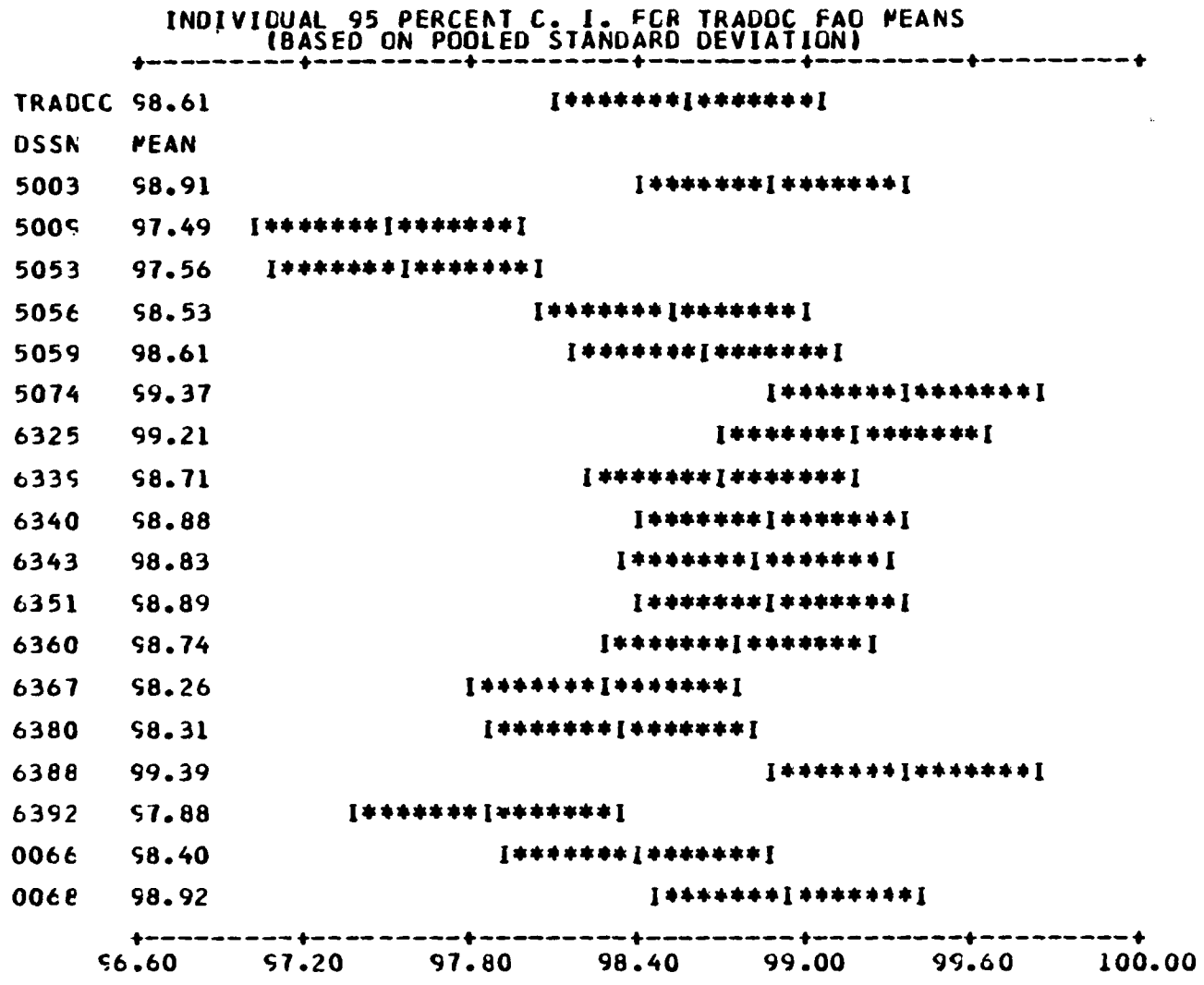

INDIVIDUAL 95 PERCENT C. I. FOR TRADOC FAO MEANS
(BASED ON POOLED STANDARD DEVIATION)
TRADOC 98.61
DSSN MEAN
5003 98.91
5005 97.49
5053 97.56
5056 98.53
5059 98.61
5074 99.37
6325 99.21
6335 98.71
6340 98.88
6343 98.83
6351 98.89
6360 98.74
6367 98.26
6380 98.31
6388 99.39
6392 97.88
0066 98.40
0068 98.92
96.60
97.20
97.80
98.40
99.00
99.60
100.00

FIGURE IV-9

TRADOC performance mean. Four USAREUR FAOs qualified to be identified as substandard performers using this alternative. Figure IV-10 clearly shows that FAOs with DSSNs 5495, 5580, 5588, and 6324 would be identified as substandard.

Additionally, the comparison of the previously identified categories of SS, MS, and NS with the above graphical alternative resulted in the correct identification of three of five of the previously categorized "SS" FAOs in TRADOC, three of four in USAREUR, and the identification of one "MS" categorized FAO in USAREUR.

It is of interest to note that DSSN 5580 within USAREUR was previously identified by the binomial distribution as "marginally substandard" having been in the bottom quartile seven out of 18 months (there is a 21% chance of seven or more failures out of 18 trials), it was however identified as substandard by each of the three alternative methods presented in this section.

Since this alternative evaluates performance over a period of 18 months, the month of detection, as annotated in Table IV-6, will not be until month 18. Results of this alternative are summarized in Table IV-6.

d. Comparison of Results

Comparison of the three alternatives disclosed that Alternatives #I-1 and #I-2 produced quite similar outcomes in identifying substandard performances by FAOs (12 FAOs were detected by both alternatives). It is of interest

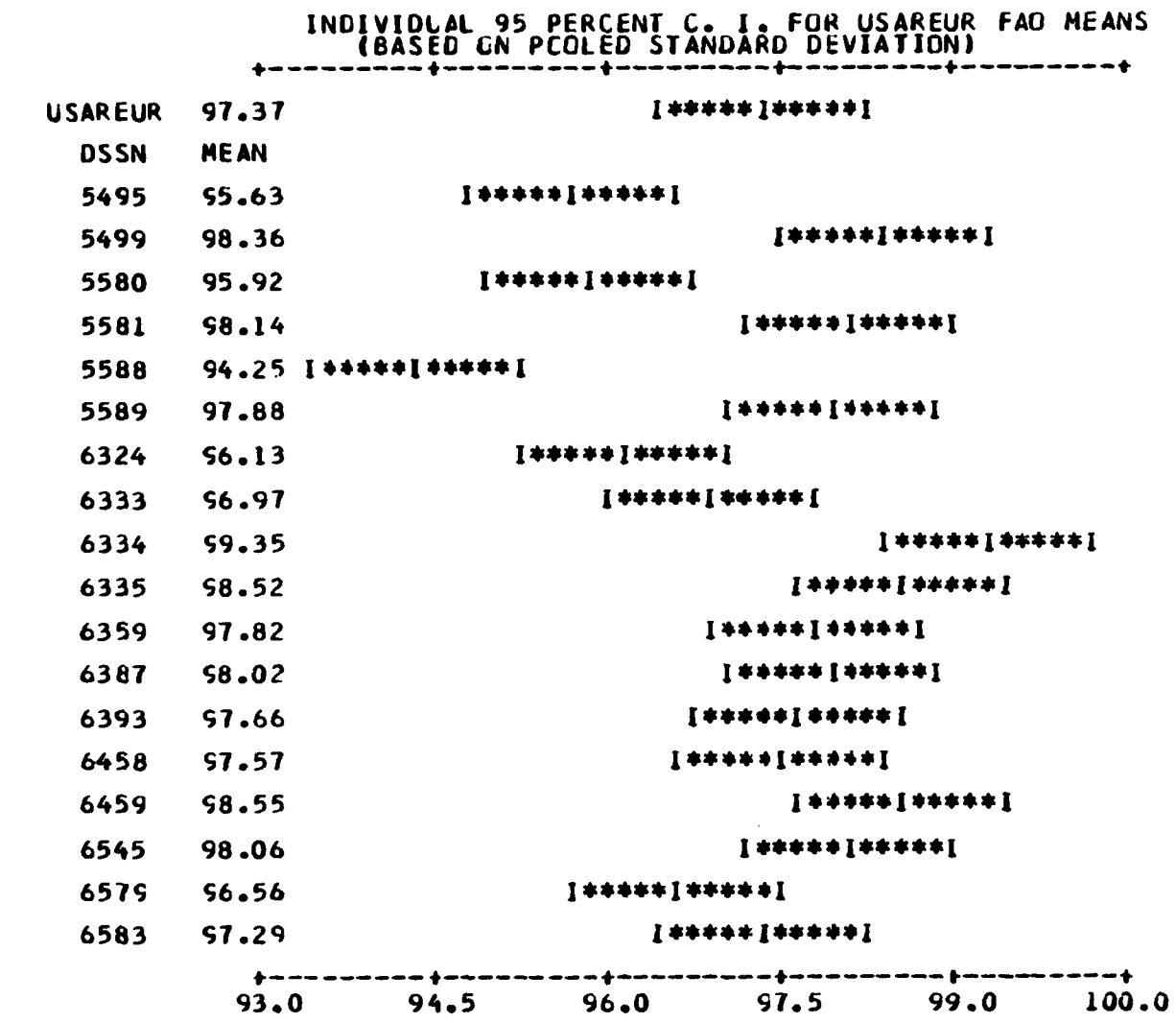

INDIVIDUAL 95 PERCENT C. I. FOR USAREUR FAO MEANS
(BASED ON POOLED STANDARD DEVIATION)
USAREUR 97.37
DSSN MEAN
5495 95.63
5499 98.36
5580 95.92
5581 98.14
5588 94.25
5589 97.88
6324 96.13
6333 96.97
6334 99.35
6335 98.52
6359 97.82
6387 98.02
6393 97.66
6458 97.57
6459 98.55
6545 98.06
6579 96.56
6583 97.29
93.0
94.5
96.0
97.5
99.0
100.0

FIGURE IV-10

to note that all FAOs identified by Alternative #I-3 were identified by Alternative #I-2, and that Alternative #I-1 identified all of the FAOs identified by Alternative #I-2, thus all by Alternative #I-3. The first two alternatives also produced similar results in the area of timeliness of identification of substandard performance. Alternative #I-1 detected three FAOs before Alternative #I-2, whereas Alternative #I-2 detected five FAOs before Alternative #I-1 (four FAOs were detected in the same month by both alternatives).

Although, Alternative #I-2 was initially thought to have promise as being a quicker method for identifying substandard performances than Alternative #I-1, the results of the trial application did not provide strong support for such a conclusion. It should be noted that due to the author-selected 13 month moving average method utilized for Alternative #I-3, timeliness of identification of substandard performances by this alternative was not competitive with the months of detection for the first two alternatives. Alternative #I-3 does, however, have its own advantages as described in section D.2.

2. Analysis of the Methodology for the Assessment of the Current Financial Network Profile

The methodology for the development of the current financial network profile facilitates the assessments of MACOM performance profiles and the current (monthly) "health"

of the financial network. The data analyzed for the test period January 1980 - June 1981 was used to calculate the performance means for each MACOM and DA-wide. Since the data sample was for 18 months, and current performance (June 1981) was to be measured against the historical means, the authors used 17 months for the calculation of the historical means. The historical means for the Military Pay category reflected the results which are presented in the following section.

a. JUMPS Transactions Acceptance Rates

The analysis of historical data disclosed that there were significant statistical differences in the MACOM historical performance means between TRADOC and FORSCOM, TRADOC and USAREUR, and FORSCOM and USAREUR. This is graphically represented by Figure IV-11. Figures IV-12, 13, and 14 graphically identify the current month performances of FAOs above and below the MACOM's 95% confidence interval about the historical mean. The graphical comparison of current (June 1981) performance data with the MACOM historical mean disclosed that there were statistically significant differences between the current month performance means (denoted graphically by dotted lines) of FAOs within TRADOC, FORSCOM and USAREUR, and the MACOM historical means. The results of the comparisons can be interpreted as follows: In the case of FORSCOM, one can state that the current FAOs' performance mean was lower (worse) than the 95% confidence interval of the MACOM historical mean. This situation was

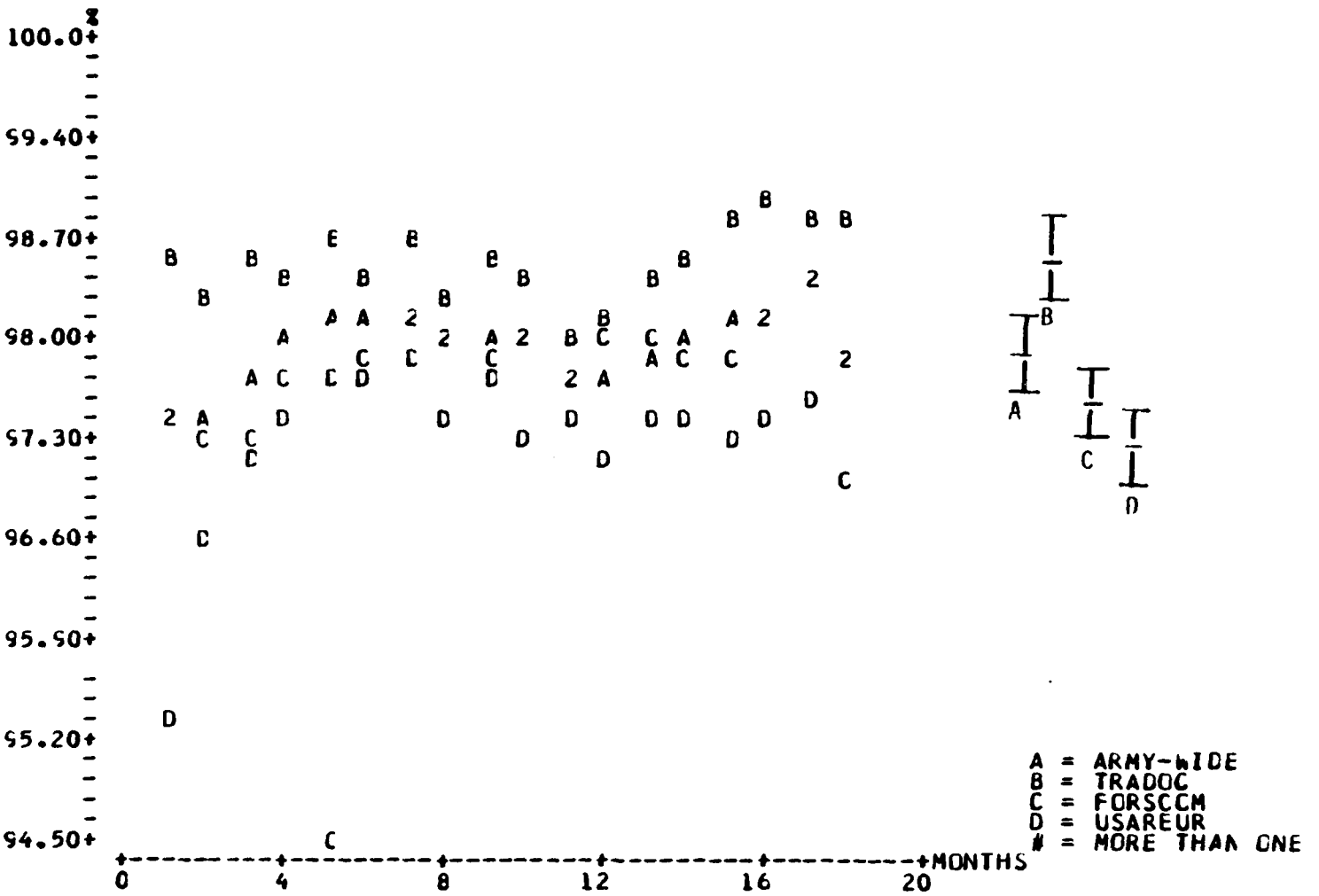

MACCM MEANS: ACCEPTANCE RATES
%
100.0+
99.40+
98.70+
98.00+
97.30+
96.60+
95.90+
95.20+
94.50+
0
4
8
12
16
20
MONTHS
A = ARMY-WIDE
B = TRADOC
C = FORSCOM
D = USAREUR
# = MORE THAN ONE

FIGURE IV-11

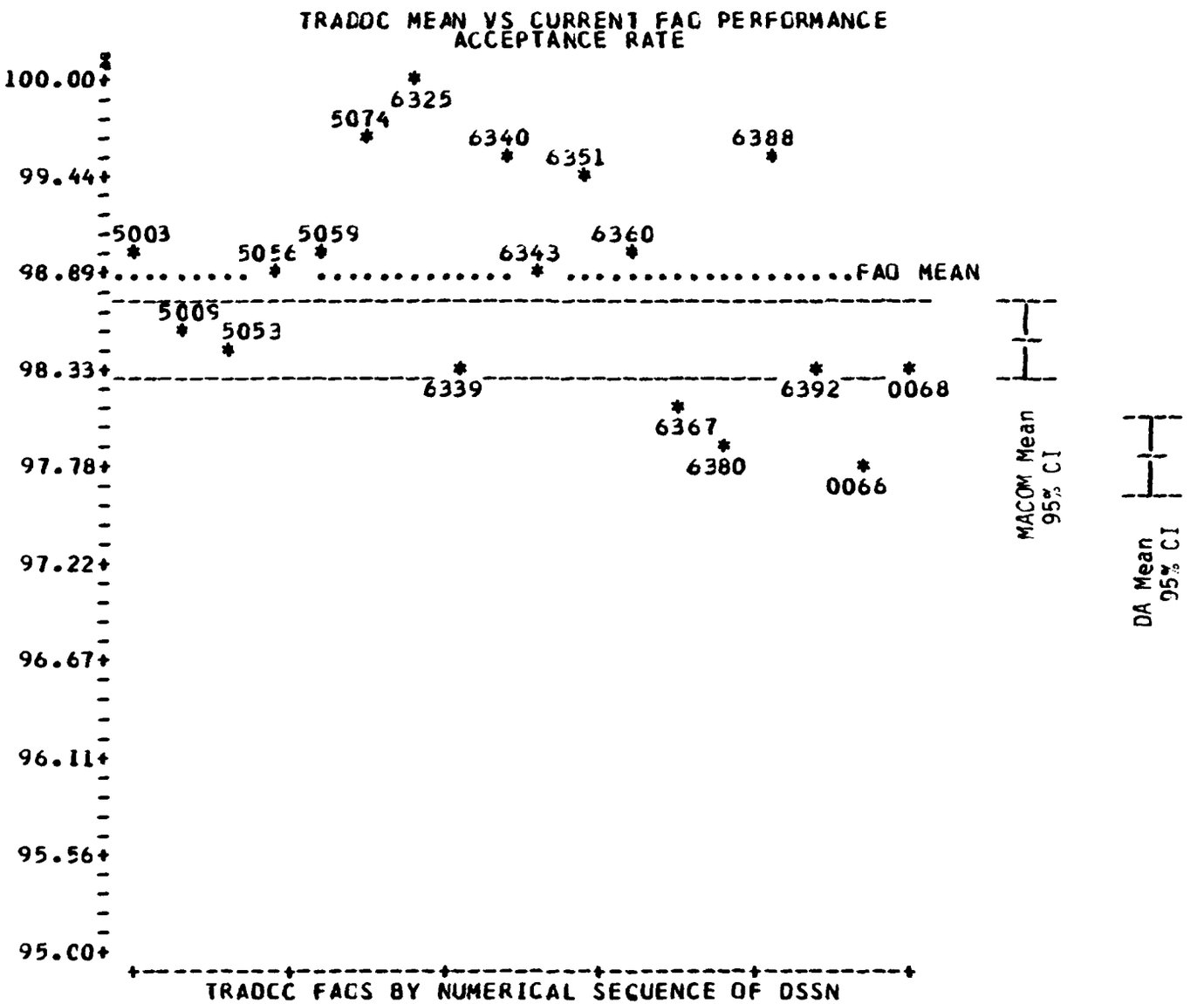

TRADOC MEAN VS CURRENT FAC PERFORMANCE
ACCEPTANCE RATE
100.00
99.44
98.89
98.33
97.78
97.22
96.67
96.11
95.56
95.00
6325
5074
6340
6351
6388
5003
5059
5056
6360
6343
FAO MEAN
5009
5053
6339
6392
0068
6367
6380
0066
MACOM Mean
95% CI
DA Mean
95% CI
TRADOC FACS BY NUMERICAL SEQUENCE OF DSSN

FIGURE IV-12

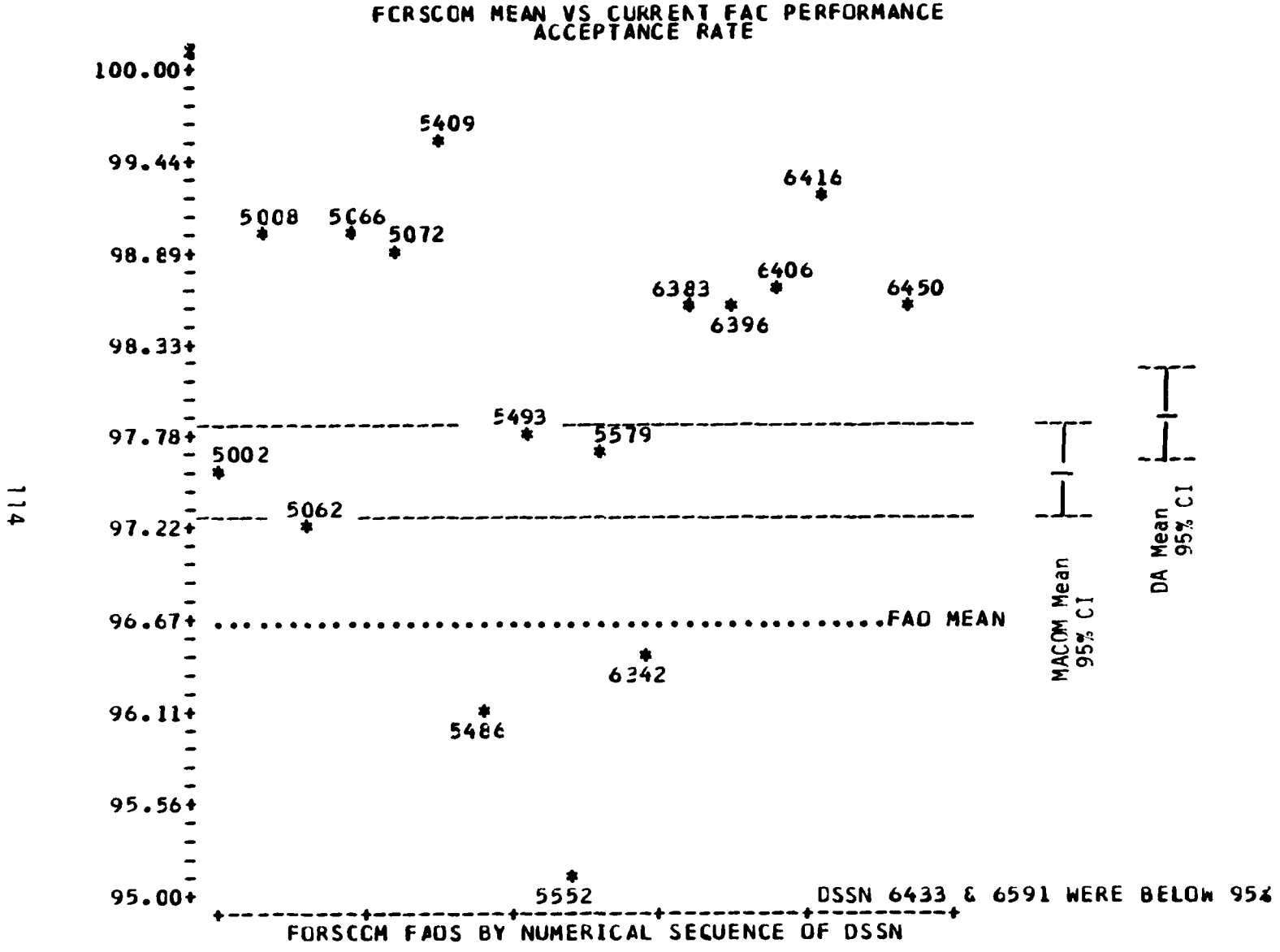

FCRSCOM MEAN VS CURRENT FAC PERFORMANCE
ACCEPTANCE RATE
100.00
99.44
98.89
98.33
97.78
97.22
96.67
96.11
95.56
95.00
5409
6416
5008
5066
5072
6406
6383
6450
6396
5493
5579
5002
5062
FAO MEAN
6342
5486
5552
MACOM Mean 95% CI
DA Mean 95% CI
DSSN 6433 & 6591 WERE BELOW 95%
FORSCOM FAOS BY NUMERICAL SEQUENCE OF DSSN

FIGURE IV-13

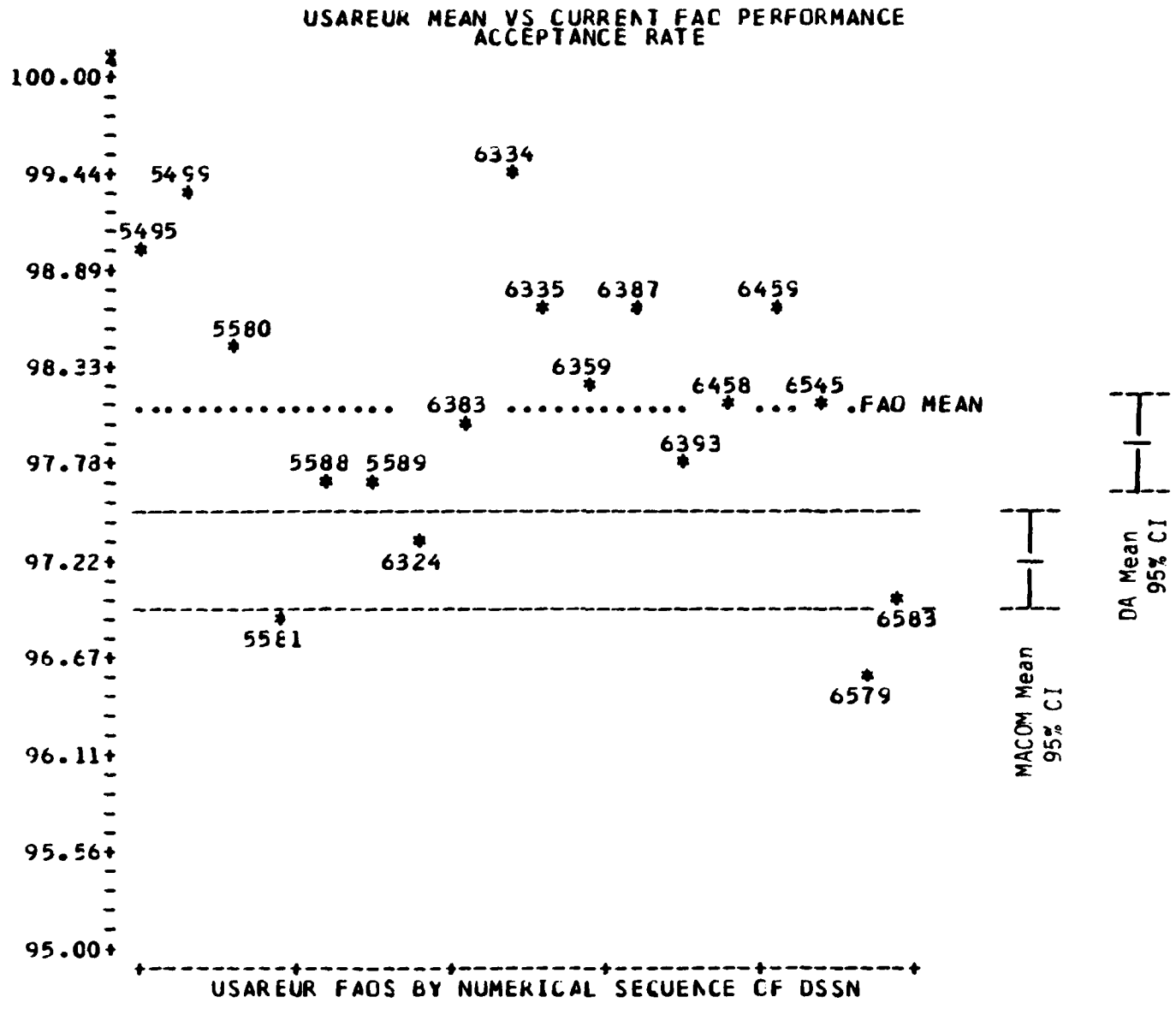

USAREUR MEAN VS CURRENT FAC PERFORMANCE
ACCEPTANCE RATE
100.00
99.44
98.89
98.33
97.78
97.22
96.67
96.11
95.56
95.00
5499
5495
6334
6335
6387
6459
5580
6359
6458
6545
FAO MEAN
6383
6393
5588
5589
6324
6583
5581
6579
MACOM Mean
95% CI
DA Mean
95% CI
USAREUR FAOS BY NUMERICAL SEQUENCE OF DSSN

FIGURE IV-14

primarily caused by two FAOs whose acceptance rates were below the 95% level. In the case of TRADOC and USAREUR, the current (June 1981) performance profiles exhibit performance means of the FAOs which were statistically higher (better) than the MACOM's historical mean.

b. Late Pay Change Rates

The analysis of the historical data disclosed that there were significant statistical differences between all of the MACOMs' mean performances for the 18 month period. The late pay change rate is an indicator in which the better performance is reflected by a lower percentage. The graphical representation of the historical performance mean indicated that TRADOC exhibited a significantly lower (better) historical performance mean than both FORSCOM and USAREUR, and that FORSCOM exhibited a statistically significant lower (better) performance mean than USAREUR (Figure IV-15).

The comparison of current (June 1981) performance data with the MACOM historical performance mean indicated that no statistically significant differences in performance existed, for the current month, between FAOs and their MACOM's historical mean. The graphical presentations in Figures IV-16, 17, and 18 identify the performances of FAOs within each MACOM, which performed above (bad) and below (good) the MACOM's 95% confidence interval about the historical mean. The current performance profiles indicate little relative change from the MACOM historical mean.

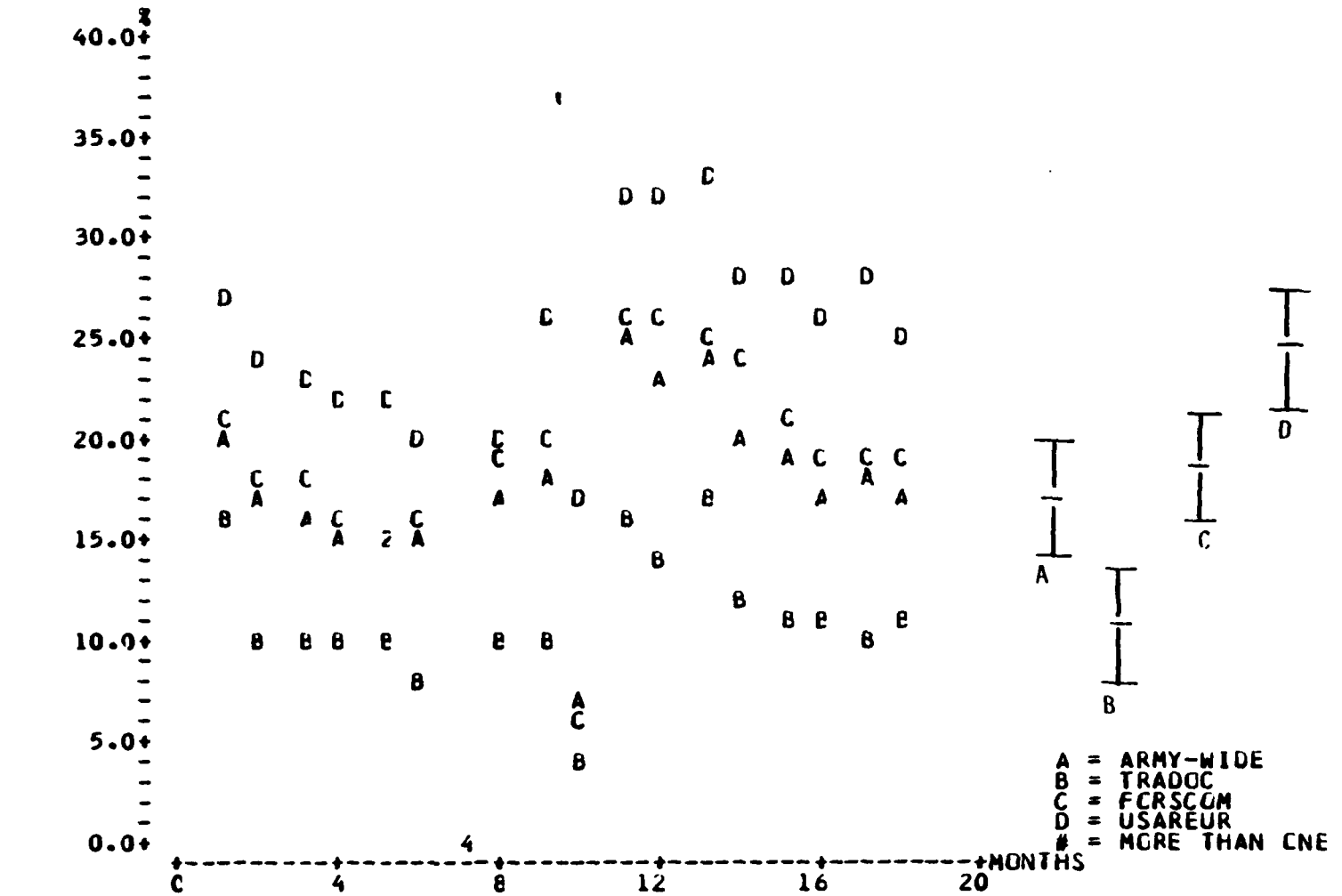

MACCM MEANS: LATE PAY CHANGE RATES
%
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0
4
8
12
16
20
MONTHS
A = ARMY-WIDE
B = TRADOC
C = FORSCOM
D = USAREUR
# = MORE THAN ONE

FIGURE IV-15

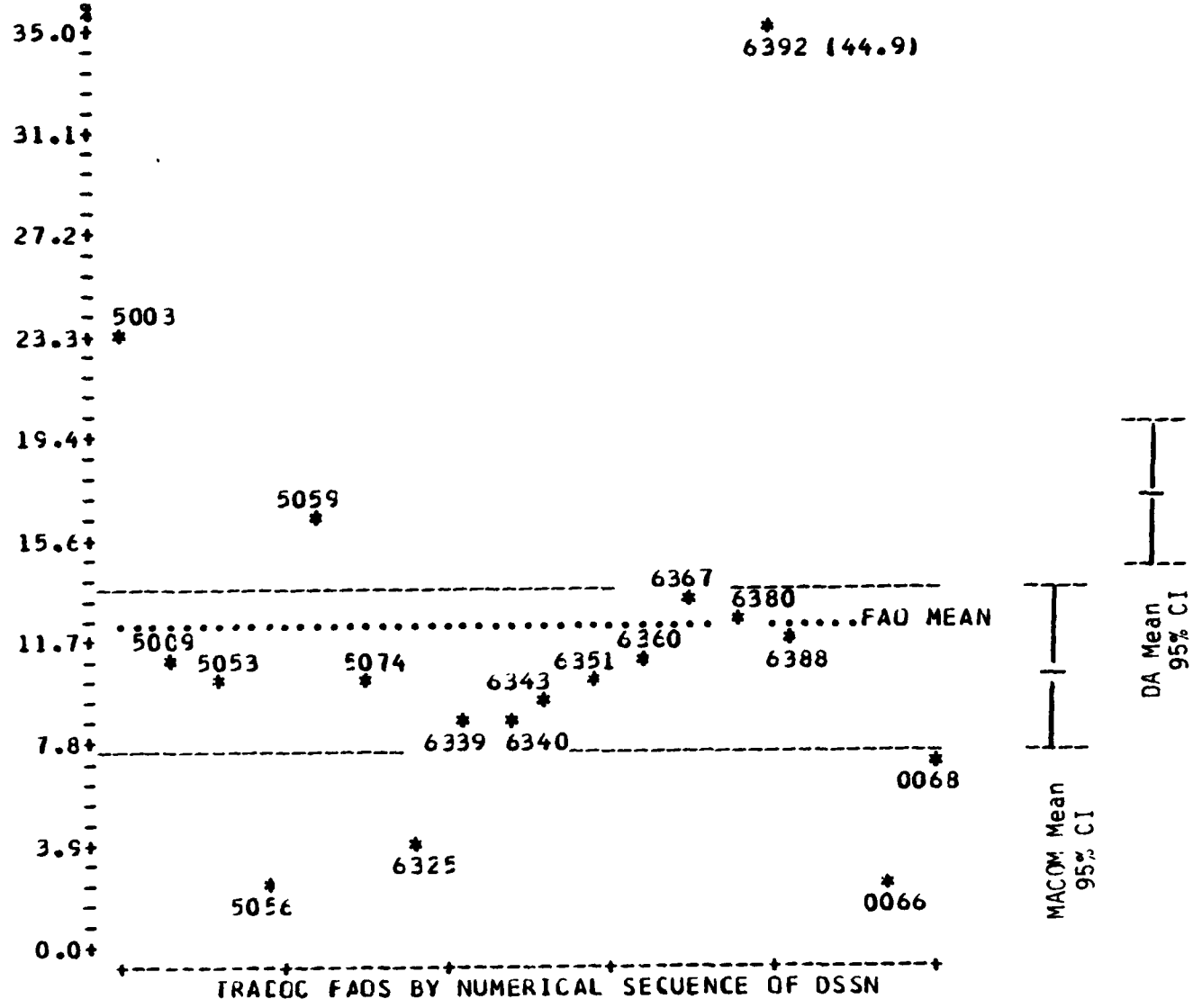

TRACOC MEAN VS CURRENT FAO PERFORMANCE
LATE PAY CHANGE RATE
35.0+
31.1+
27.2+
23.3+
19.4+
15.6+
11.7+
7.8+
3.9+
0.0+
6392 (44.9)
5003
5059
6367
6380
FAO MEAN
5009
5053
5074
6360
6351
6388
6343
6339
6340
0068
6325
5056
0066
MACOM Mean
95% CI
DA Mean
95% CI
TRACOC FAOS BY NUMERICAL SECUENCE OF DSSN

FIGURE IV-16

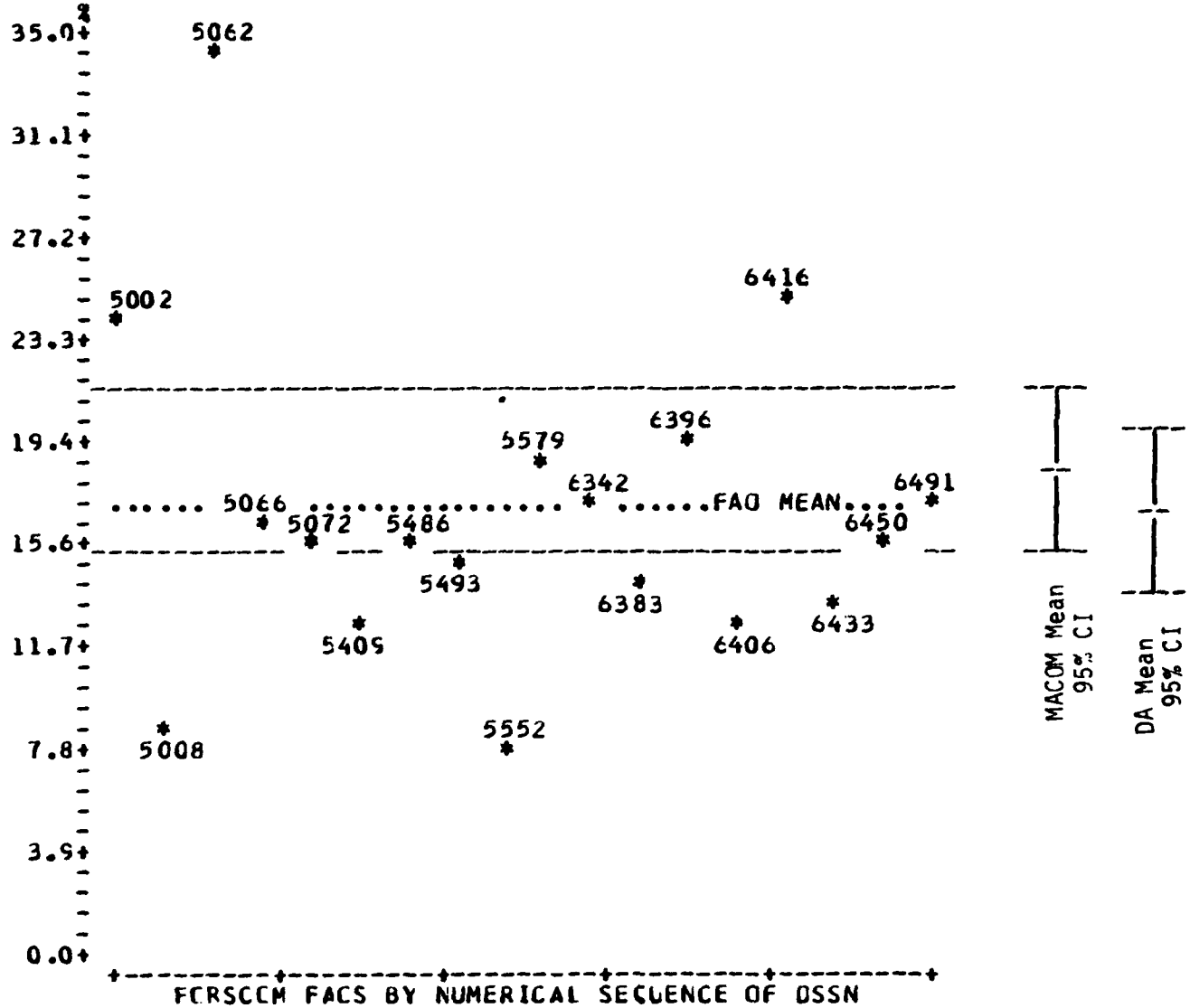

FCRSCOM MEAN VS CURRENT FAC PERFORMANCE
LATE PAY CHANGE RATE
35.0%
31.1
27.2
23.3
19.4
15.6
11.7
7.8
3.9
0.0
5062
5002
6416
6396
5579
6342
6491
5066
5072
5486
FAO MEAN
6450
5493
6383
6433
5409
6406
5552
5008
MACOM Mean 95% CI
DA Mean 95% CI
FCRSCOM FACS BY NUMERICAL SEQUENCE OF OSSN

FIGURE IV-17

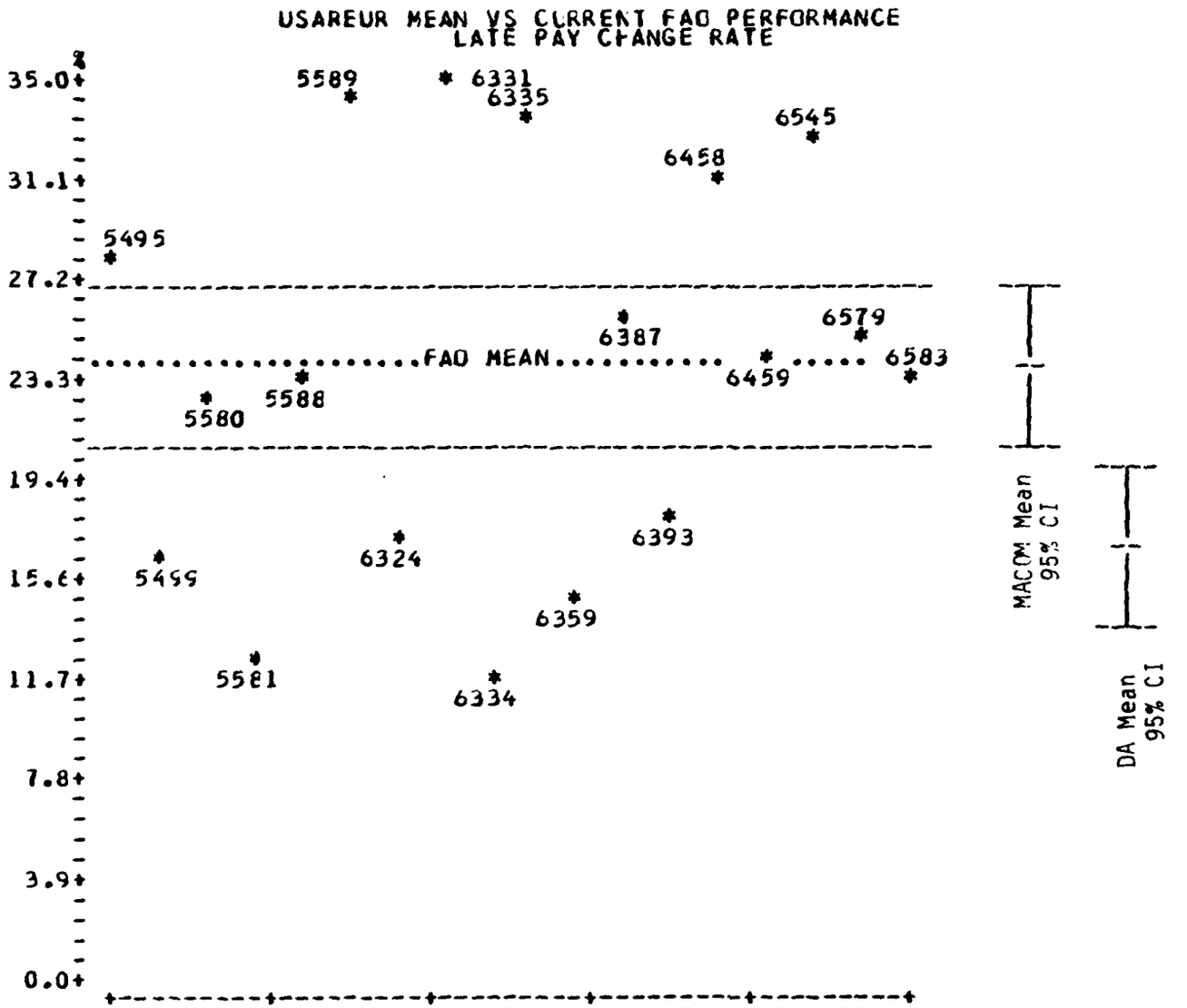

USAREUR MEAN VS CURRENT FAO PERFORMANCE
LATE PAY CHANGE RATE
%
35.0+
31.1+
27.2+
23.3+
19.4+
15.6+
11.7+
7.8+
3.9+
0.0+
5589
6331
6335
6545
6458
5495
6387
6579
FAO MEAN
6459
6583
5588
5580
6324
6393
5499
6359
5581
6334
MACOM Mean 95% CI
DA Mean 95% CI
USAREUR FAOS BY NUMERICAL SEQUENCE OF DSSN

FIGURE IV-18

c. Last Three Update Rate

The analysis of historical data of this data indicator disclosed that there was a statistically significant difference between the MACOM historical performance means for TRADOC and FORSCOM. The last three update rate is an indicator in which better performance is reflected by a lower percentage. The composite graphical representation in Figure IV-19 indicates that the TRADOC historical performance mean is lower (better) than FORSCOM's.

Additionally, the comparison of current performance data with the MACOM historical performance means disclosed that in all three cases a statistically significant difference existed between the current month performance means of the FAOs within the MACOMs and the MACOM's historical performance mean (Figures IV-20, 21, and 22). The figures graphically identify the FAO's current month's performances above (bad) and below (good) the MACOM 95% confidence interval about the historical mean performance The. results of the comparisons can be interpreted as follows: the current (monthly) performance profiles indicate that the composite "current" profile of all FAOs within each MACOM significantly exceed (better than) the MACOM's historical performance mean. If this situation continues in the following months, each MACOM will experience movement toward improved performance for this data indicator. If this situation continues in all the MACOMs, then movement toward improved DA-wide performance may exist.

MACCM MEANS: LAST THREE UPDATES RATES

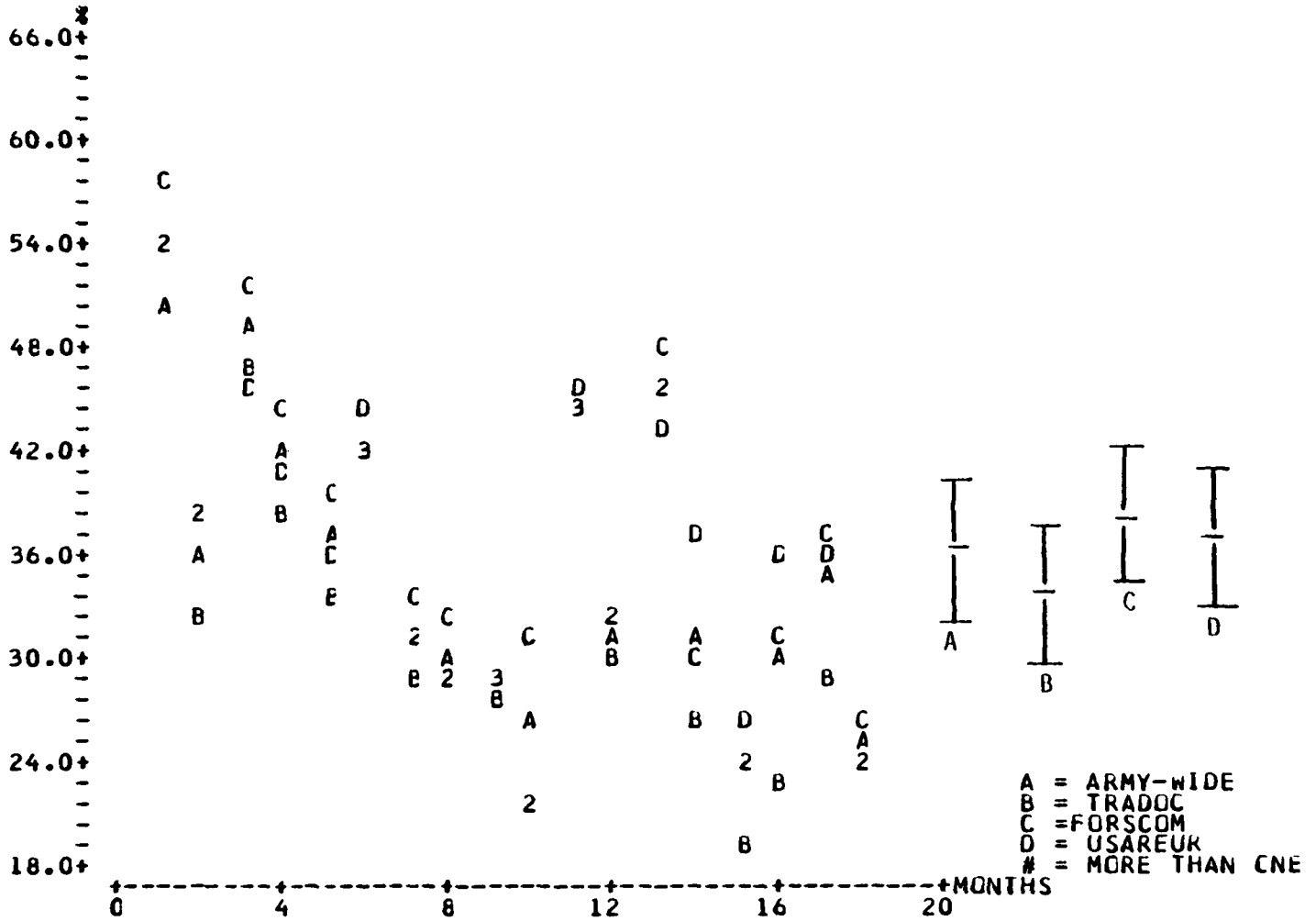


FIGURE IV-15

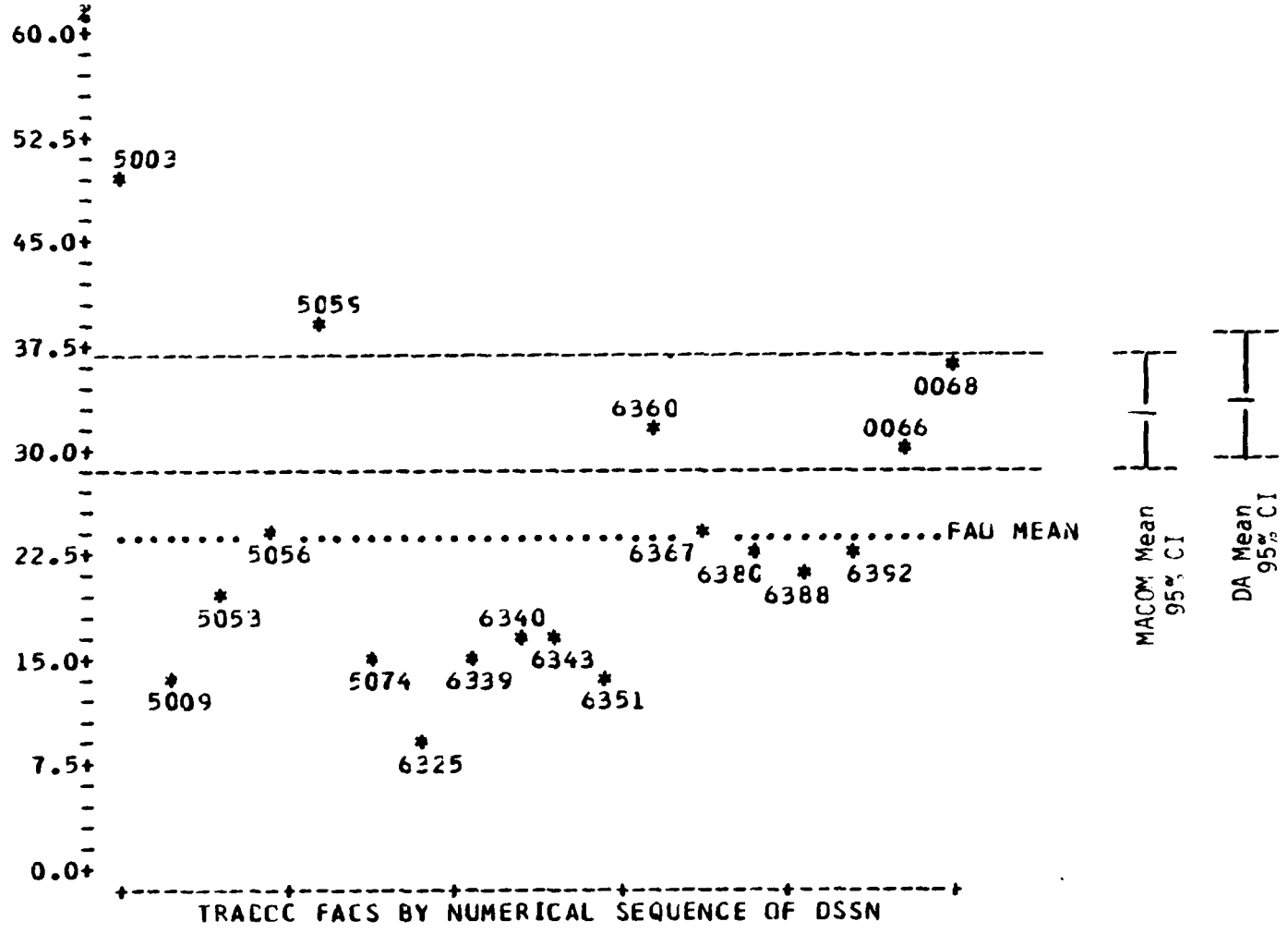

TRADOC MEAN VS CURRENT FAC PERFORMANCE
LAST THREE UPDATE RATE
60.0
52.5
45.0
37.5
30.0
22.5
15.0
7.5
0.0
5003
5055
6360
0068
0066
FAU MEAN
5056
6367
6380
6388
6392
5053
6340
6343
5009
5074
6339
6351
6325
MACOM Mean 95% CI
DA Mean 95% CI
TRADOC FACS BY NUMERICAL SEQUENCE OF DSSN

FIGURE IV-20

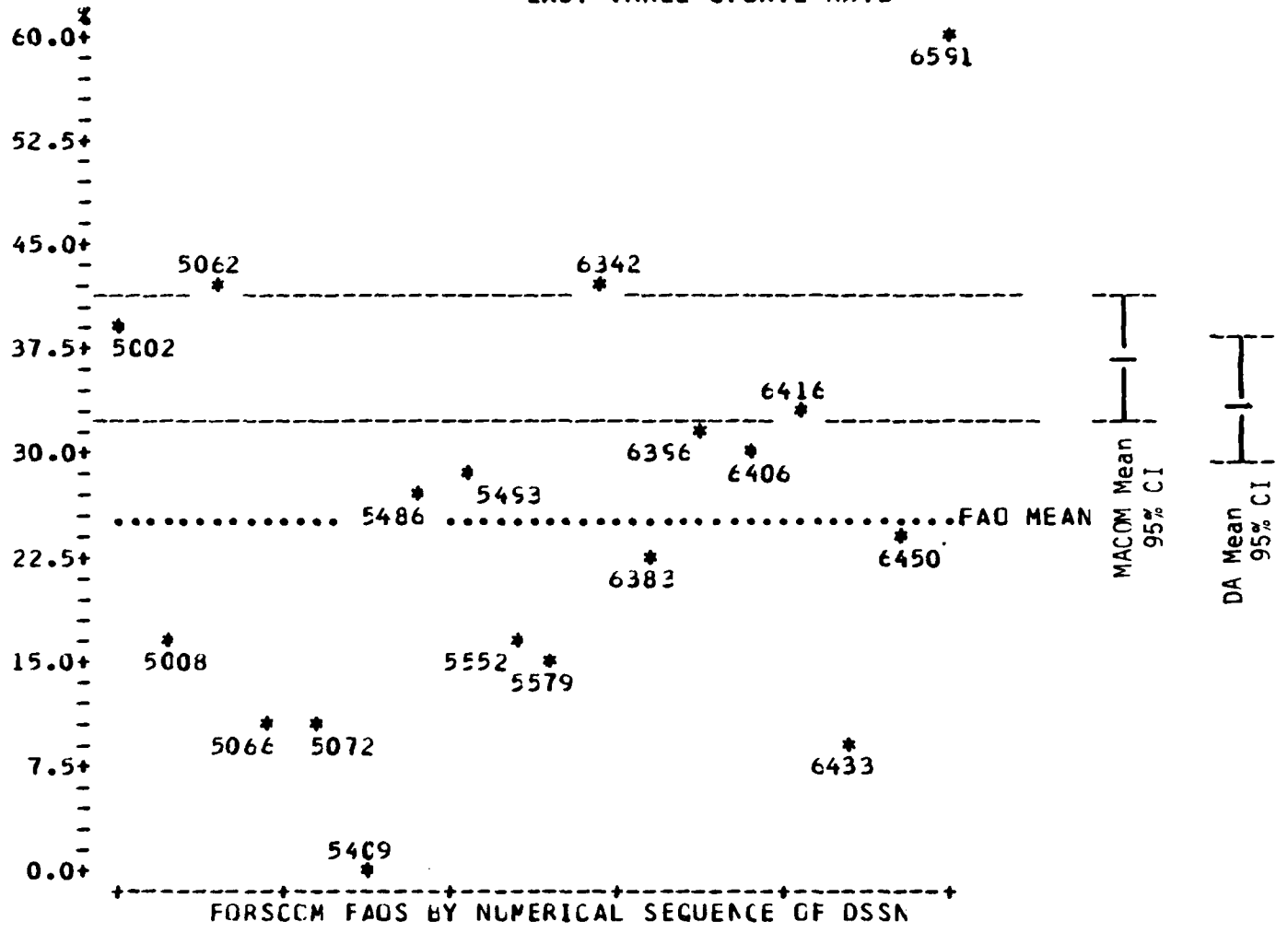

FORSCOM MEAN VS CURRENT FAC PERFORMANCE
LAST THREE UPDATE RATE
%
60.0+
52.5+
45.0+
37.5+
30.0+
22.5+
15.0+
7.5+
0.0+
5062
6342
6591
5002
6416
6396
6406
5493
5486
FAO MEAN
6450
6383
5008
5552
5579
5066
5072
6433
5409
MACOM Mean 95% CI
DA Mean 95% CI
FORSCOM FAOS BY NUMERICAL SEQUENCE OF DSSN

FIGURE IV-21

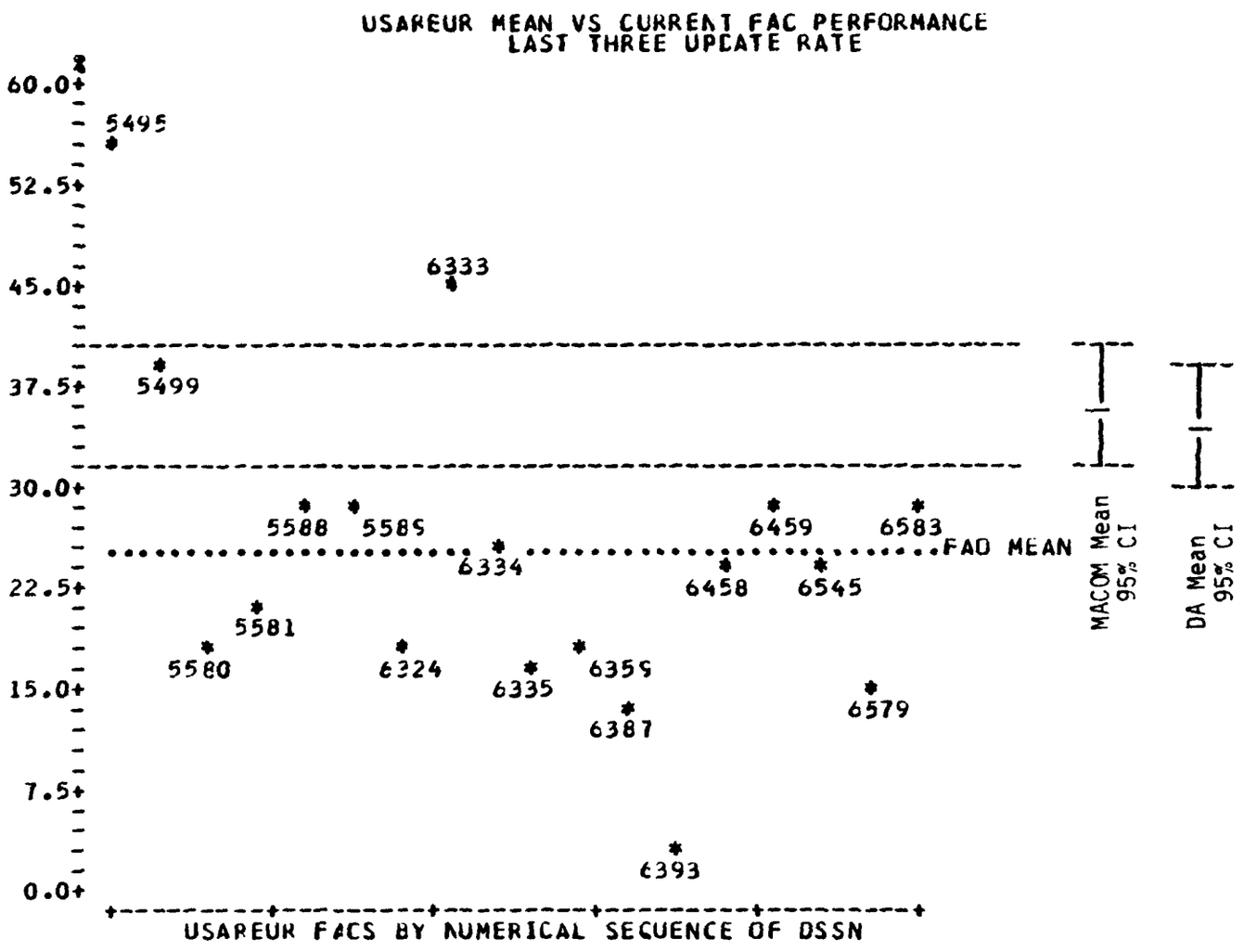

USAREUR MEAN VS CURRENT FAC PERFORMANCE
LAST THREE UPDATE RATE
60.0
52.5
45.0
37.5
30.0
22.5
15.0
7.5
0.0
5495
6333
5499
5588
5585
6459
6583
FAD MEAN
6334
6458
6545
5581
5580
6324
6335
6359
6579
6387
6393
MACOM Mean 95% CI
DA Mean 95% CI
USAREUR FACS BY NUMERICAL SECUENCE OF DSSN

FIGURE IV-22

F. SUMMARY

In this chapter the authors described the data sample used for analyses: three critical data indicators from the Military Pay category for the 18 month period of January 1980-June 1981, for three MACOMs each consisting of 13 randomly sampled FAOs. The data sample was examined for statistical properties, which determined the type of analytical model to be used in the further analyses of the data. The data sample was tested to assess the effectiveness of DA QA assistance visits. Methodologies were described for operationally identifying substandard performances of DA FAOs, and for enabling the Director for Quality, USAFAC to assess the current health of the financial network.

Two tests were performed for assessing the effectiveness of DA QA assistance visits to field FAOs.

1. Test #1 - perform the "t-test" for statistically significant differences in the post-visit versus pre-visit mean performances for the individual FAOs and the MACOM composite means.

2. Test #2 - graphically compare the FAOs' and MACOMs' pre-and post-visit performance to the intuitive trans-visit performance model.

The sample data for the FAOs of the three MACOMs was used to test the effectiveness of the DA QA assistance visits on the one critical data indicator: JUMPS transactions acceptance rates, with the following results: Test #1 showed that the DA QA assistance visits improved the performance for only five of 54 FAOs at the 95% confidence level; Test #2 disclosed that none seemed to show a significant improvement

attributable to the DA QA assistance visit. The pre- and post-visit performance patterns of the FAOs identified by Test #1 were illustrated for comparison to the intuitive trans-visit model. The tests did not establish the effectiveness of assistance visits but, as was pointed out, by nature of their design the tests could not establish lack of effectiveness.

To identify substandard performances of DA FAOs, three alternative methods were developed:

1. Alternative #I-1 - identify as substandard performers all FAOs which appear in the monthly bottom quartile, four or more times during any six month period.

2. Alternative #I-2 - identify as substandard performers all FAOs which appear in the monthly bottom quartile, for three or more consecutive months.

3. Alternative #I-3 - identify as substandard all FAOs for which its 18 month moving average of performance is statistically-discernibly lower than its MACOM mean performance for the same period.

The data sample was used to test the alternative methods for identifying substandard performances, which were developed in this chapter. The analysis revealed the following: Alternative #I-1 identified 13 FAOs as substandard performers; Alternative #I-2 identified 12 FAOs as substandard performers; Alternative #I-3 identified seven FAOs as performing in a substandard manner. The results of each alternative were compared to pre-identified categories of "significantly substandard", "marginally substandard", and "not substandard" to determine if the alternatives would

identify those FAOs which were previously identified as "significantly substandard". The first two alternatives correctly identified all the "significantly substandard" FAOs, whereas Alternative #I-3 correctly identified six out of nine "significantly substandard" FAOs. Additionally, the first two alternatives identified several (four and three respectively) "marginally substandard" FAOs. Alternative #I-3 identified one of the "marginally substandard" FAOs also identified by the other two alternatives. The analysis also revealed that Alternatives #I-1 and #I-2 produced results which were quite similar in regards to timeliness of detection of substandard performances.

The methodology developed for assessing the current health of the DA financial network used graphical presentations to compare the individual FAOs' "current" month performance with the most recent 17 month historical performance mean for the MACOMs. Finally, the data sample was analyzed to graphically assess the "current health" of the DA financial network. The analysis revealed the following: The "current" month performance in the "JUMPS transaction acceptance rate" indicator was above (better than) the historical performance mean for all three MACOMs evaluated. The "late pay change rate" indicator disclosed no significant difference between current performance and their historical performance means for any of the three MACOMs. All three MACOMs demonstrated significantly better performance in the "last three update" indicator.

The next chapter of this thesis will summarize the conclusions of this chapter and the preceeding chapters. Based on this review, recommendations for the improvement of the DA QA program will also be presented.

V. CONCLUSIONS AND RECOMMENDATIONS

A. GENERAL SUMMARY

The purpose of this thesis was to identify methods for assessing the fiscal performance of Department of the Army (DA) Finance and Accounting Offices (FAOs) to assist the United States Army Finance and Accounting Center (USAFAC), Office of Field Evaluation/Analysis in the determination of the magnitude and directional emphasis of the DA Financial Management Quality Assurance (QA) Program. The objectives established in Chapter I to achieve this purpose were to:

1. Develop tests for assessing the effectiveness of DA QA assistance visits to the field FAOs.
2. Develop a methodology for identifying substandard performance by FAOs.
3. Develop a method for assessing the current health of the total DA financial network.
4. Make recommendations for improvements to the DA QA program based on the research and analysis performed by the authors.

In accomplishing these objectives, Chapter II provided the background material on the organization and functions of the DA financial network as well as a description of the DA QA program. Chapter III provided definitive material on the historical development and current status of the DA financial management control system.

Chapter IV reported on analyses of the data sample and the results of two tests assessing the effectiveness of DA QA assistance visits. It also contained descriptions of methodologies for identifying substandard performance by FAOs and for enabling the Director for Quality to assess the current health of the DA financial network. Finally, Chapter IV reported the results of analyses conducted on sample data to determine the validity of these methodologies.

This chapter will summarize conclusions as to the utility of the methodologies developed in Chapter IV. It will also list recommendations for improvements to the DA QA program.

B. CONCLUSIONS

The primary intent of this research was to develop methodologies which can assist the Director for Quality in determining the magnitude and directional emphasis of the DA QA Program. The absence of a USAFAC-developed methodology for identifying substandard performance precluded a comparison of results from the USAFAC-developed methods with the results obtained by the authors in this thesis. The following conclusions drawn by the authors are a result of the analyses conducted in Chapter IV .

The tests performed for assessing the effectiveness of DA QA assistance visits disclosed that strong support for the hypothesis that improved performance by FAOs could be attributed to the DA QA assistance visits, was not evident. Two alternative methods were developed. The first method

assessed effectiveness by identifying statistically significant differences in pre-visit and post-visit mean performances. The second method compared the actual pre- and post-visit performance pattern to an intuitive pre- and post-visit performance pattern. This alternative has an inherent weakness in that it is largely a subjective process. However, it has the advantage in that the subjective expertise gained by the analyst may enable the identification and subsequent explanation of significant events not brought forth by statistical tests. It is the authors' belief that Test #1 is preferable to Test #2, however, the use of both methods will best enable the Director for Quality to assess the effectiveness of DA QA assistance visits.

The methodologies developed in Chapter IV for identifying substandard performance of FAOs disclosed that substandard performance exists, and can be identified through the application of these methodologies. Through the use of sample data from TRADOC and USAREUR, the authors tested the three alternative methods developed for identifying substandard performance. The results of these tests identified 13 FAOs as substandard using Alternative #I-1, 12 FAOs as substandard using Alternative #I-2, and 7 FAOs as substandard using Alternative #I-3, as compared to the other FAOs in the MACOM and the MACOM composite performance mean. The advantage of Alternative #I-1 is that it evaluates performance over a "moderate" six month period, which the

authors believed to be a good choice to balance sensitivity and smoothing. The primary advantage of Alternative #I-2 is that it may identify substandard performance more rapidly than Alternative #I-1, if a FAO is bad enough to show three consecutive months of being ranked in the bottom quartile. Alternative #I-3's strength is that, by evaluating performance through the use of a moving average, it looks at "how bad" a FAO's performance is, rather than just monthly ordinal rankings. Clearly, by using the three alternatives in conjunction with one another, the Director for Quality will be able to more accurately identify substandard FAOs.

The method developed to assess the current health of the DA financial network disclosed that the objective assessment of performance profiles can be made. Major Command (MACOM) historical performance means were developed for three critical data indicators in the Military Pay category. The current performance of FAOs within the MACOMs were measured against these historical means which disclosed that statistically significant differences existed between "current" performance and the historical data in two of the three critical data indicators. The analysis of the third indicator disclosed that performance was not different from the historical means. The utilization and application of this methodology to other critical data indicators will enable the Director for Quality to more accurately assess the "total" health of the financial network at both the DA and MACOM levels of command.

C. RECOMMENDATIONS

One of the objectives of this thesis was to make recommendations for the improvement of the DA QA program. This final section will address recommendations for improvements based on the authors' research and analysis performed in the preceding chapters. Additionally, this section will present some recommendations for future consideration.

The authors recommend that the Director for Quality implement the tests and methodologies developed in this thesis for assessing the effectiveness of DA QA assistance visits, for identifying substandard performance by FAOs, and for assessing the current health of the DA financial network. Implementation of these tests and methodologies will allow the Director for Quality to improve the DA QA program as stated in the following paragraphs.

First, although not addressed in the research, the authors believe that the Director for Quality may improve the ability to determine the composition of the DA QA assistance teams prior to visiting a FAO. Since FAO performances will vary among critical data indicators, insight into the particular weaknesses of the FAO to be visited, as reflected in weaknesses in particular critical data indicators, may help the Director for Quality to individually tailor each assistance team in accordance with the perceived and documented (FINOPS and FINES) needs of the FAO.

Second, the Director for Quality will be able to more accurately identify the FAOs in need of assistance based on utilizing the methodologies developed for identifying substandard performances. The authors believe that if the Director for Quality is able to more accurately determine the directional emphasis of its assistance teams through the use of the developed methodologies, then the DA QA Program would become more effective.

Third, the analysis of sample data in Chapter IV indicated that the DA QA assistance visits appeared to result in improvement in the critical data indicator: JUMPS transactions acceptance rate, for only five out of 54 FAOs. It could not be concluded from this analysis that assistance visits were generally effective in improving JUMPS transactions acceptance rates. The continuous review and analysis of the results from assistance visits can be utilized to determine the responsiveness of critical data indicators to assistance visits. For example, analysis of DA QA assistance visits over a period of time may indicate that the critical data indicator for transaction acceptance rates is in fact responsive to assistance visits, whereas the critical data indicator for late pay changes may not be affected whatsoever by the visits. This type of information would provide a basis for making improvements to the overall FAO performance measurement system by evaluating the effectiveness of the assistance visits in terms of responsive indicators only.

Although not addressed by this research, the authors offer the following additional recommendations for future consideration:

1. The analysis of critical data indicators be automated to provide for timely feedback to the decision-makers at all levels of command.

2. Further efforts be made toward the development of quantifiable MACOM and DA performance standards.

3. Specific extended assistance be provided to those offices experiencing continous substandard performances in specific functional areas, through the DA QA assistance program.

4. Statistical analyses be utilized in providing a pre-assignment presentation for Finance and Accounting Officers to be assigned to a specific office.

5. The analyses for the identification of substandard performances be utilized for prioritization of assistance visits to stations during periods of budgetary constraints.

6. A DA/MACOM awards program for continuous superior performances by FAOs, be developed as an incentive for performing above the MACOM standards.

7. Further research be performed to determine the relative importance of each functional area and associated indicator, as perceived by the Finance and Accounting Officer, for future correlational analysis between managerial profiles and operational performance of the FAO. This relative scaling could further be used in consideration of assignment of managers to operations with specific documented needs.

APPENDIX A

THE FINANCE AND ACCOUNTING OFFICE

The internal organization and the functional responsibilities of the sections and branches within the Finance and Acounting Office will be presented in this Appendix. Sources of information for this appendix were Army Regulation 37-101 and the Institute of Administration Special Text 14-165.

A. THE FINANCE AND ACCOUNTING OFFICER

The Finance and Accounting Officer is directly responsible to the comptroller and is charged with maintaining a system of accounts and financial procedures through which the commander's responsibilities are stated and discharged in monetary terms.

If he is a Finance Corps officer, he is appointed through command channels by the major commander or head of an Army Staff Agency. Authority for appointment may be delegated to the installation commander. If he is other than a Finance Corps officer (e.g., Department of the Army (DA) civilian), he is appointed through the same channels, with approval of Commander, US Army Finance and Accounting Center. Commissioned officers are eligible for appointment as FAO's provided that they qualify under Specialty Code 44. To qualify for Specialty Code 44, an officer must be able to

perform various financial duties, have thorough knowledge of the organization of the Army and of Army regulations and Comptroller General decisions pertaining to disbursement of Government funds, and have a thorough knowledge of the installation and operation of accounting and financial statement analysis. DA civilians appointed as Finance and Accounting Officers must also possess the above qualifications.

The Finance and Accounting Officer receives and disburses public funds in his own name. He is held personally responsible and pecuniarily liabe for all that occurs or fails to occur in his office. A DA civilian, however, has certain legal limitations placed upon disbursing of public funds.

B. FUNCTIONS OF THE ADMINISTRATIVE SECTION

The administrative section provides overall administrative support to the entire office. Its functins include the following:

1. Processing all incoming and outgoing mail.
2. Maintaining central files for all correspondence and non-accounting documents.
3. Maintaining a technical library comprised of Army regulations and other directives.
4. Performing stenographic and typing service for the operating elements.
5. Requisitioning, storing, and issuing supplies, equipment, blank forms, etc., required to operate the office efficiently.
6. Preparing reports not of an accounting nature and maintaining records and reports pertaining to the civilian personnel in the office.

C. FUNCTIONS OF THE CENTRAL ACCOUNTING OFFICE

The Central Accounting Office (CAO) provides the installation with professional, standardized accounting and reporting functions for nonappropriated fund (NAF) activities on the installation, including the installation club system. Functions of the CAO include:

1. Maintenance of accounting journals, registers, ledgers, and subsidiary accounts.
2. Preparation of all disbursement vouchers and checks in payment of liabilities of all participating NAF activities.
3. Providing the activity managers with a list of disbursements when made.
4. Maintenance of fixed asset records.
5. Arrangement for an independent observer to witness and attest to the performance of required physical inventories, and to observe the recording of adjustments to the stock record cards.
6. Preparation of financial reports for all participating NAFs.
7. Reconciliation of bank accounts for all participating NAFs and that of the CAO.

D. FUNCTIONS OF THE QUALITY ASSURANCE BRANCH

The Quality Assurance Branch performs comprehensive audits of all areas within the FAO. Responsibilities and functions of the Quality Assurance Branch include the following:

1. Developing a written, time-phased quality assurance plan of action, encompassing all functional areas of the FAO. The plan should be flexible enough to allow for specially directed reviews directed by the Finance and Accounting Officer.

2. Checking systems and controls to insure proper operation.

3. Following work flow to insure work force compliance with regulatory procedures.

4. Insure report accuracy and compliance with financial regulations.

5. Identifying existing and potential problem areas in time to permit remedial or corrective action.

6. Prepare and submit reports of reviews, which contain findings of deficiencies and recommendations for their resolution.

E. FUNCTIONS OF THE QUALITY EDIT BRANCH

The quality edit branch audits personnel financial records of all financial changes prior to entry into JUMPS and other special audits in the military pay area requested by the FAO. It is responsible to the FAO for all matter pertaining to military pay administration.

F. FUNCTIONS OF THE PAY/EXAMINATION BRANCH

The pay examination branch prepares and certifies all disbursement vouchers, insuring that there is sufficient evidence of entitlement to approve payment. Certain other vouchers prepared elsewhere are examined and certified in this branch.

1. Military Pay Section

This section processes vouchers for pay and allowance of military personnel regularly assigned to the installation (but not yet on JUMPS) and those in transit between stations. The specific duties and responsibilities of the section include:

a. Providing accurate and timely pay service to military personnel

b. Receiving and processing substantiating documents pertaining to pay accounts.

c. Determining entitlement of military members to pay.

d. Auditing, recording, and distributing pay and allotment forms.

2. Travel Section

The Travel Section processes claims for travel performed according to written orders for military members, dependents, and DA civilians. Duties of the section include:

a. Verifying entitlements and computing amounts due.

b. Computing the number of days of travel time authorized

c. Computing travel advances.

d. Maintaining the record of travel payments file.

3. Civilian Pay Section

The civilian pay section maintains individual earnings and deduction records and prepares vouchers for payment of civilian employees. Some of the specific duties are:

a. Computing pay based on properly authenticated basic records.

b. Maintaining Civil Service Retirement and Disability Fund records and related controls, and preparing related reports.

c. Maintaining leave records and the related controls.

4. Commercial Accounts Section

The commercial accounts section prepares, audits, and processes vouchers from commercial vendors for supplies, equipment, and non-personal services. The discharge of this

responsibility includes the following functions:

a. Preparing and examining applicable vouchers.

b. Determining entitlements.

c. Computing amounts due and discounts deductible.

d. Maintaining files of contracts concerning purchases.

G. FUNCTIONS OF THE DISBURSING BRANCH

The main functions of the disbursing branch are to pay, by check or cash, properly certified vouchers received from the Pay/Examination Branch: to receive and maintain custody over all cash for which the Finance and Accounting Officer is accountable; and to maintain custody over blank checks and savings bonds.

1. Cash Section

The cash sections makes all cash payments on properly prepared and certified vouchers received from the pay branch. It receives and insures proper disposition of all cash collected by the FAO. Functions of the section include:

a. Paying approved vouchers by cash to properly identified payees.

b. Making advances of cash to agent officers and imprest fund cashiers.

c. Receiving all collections required for deposit with the finance and accounting officer and furnishing the depositors with receipts.

d. Verifying the cash at the close of each day and submitting completed vouchers and remaining cash to the chief of the Disbursing Branch for additional verification.

e. Maintaining the Cash Blotter reflecting the status and location of cash in all its forms.

2. Check and Bond Section

The checks and bond section issues and accounts for United States Treasury checks and Series EE Savings Bonds. The discharge of this responsibility includes the following functions:

a. Maintaining control over all blank checks.

b. Preparing checks for payment of approved vouchers.

c. Forwarding checks to payees by mail or to personnel authorized to distribute them.

d. Maintaining the check register. The check register is a summary list of Treasury checks issued by date, check number, dollar amount, and voucher number.

e. Accounting for and issuing savings bonds procured through cash purchase of civilian (not military) payroll deductions.

3. Scheduling Section

The scheduling section routes the original and duplicate vouchers with the Statement of Daily Transactions to the Accounting Branch for further processing. The functions of this section include the following:

a. Assigning and controlling collection and disbursement vouchers numbers.

b. Preparing SF 1096 (Schedule of Voucher Deductions). SF 1096 contains a listing of deductions subtracted from the gross dollar amount on disbursement vouchers.

c. Distributing original collection and disbursement vouchers and the Statement of Daily Transactions to the Analysis and Reconciliation Section, and voucher duplicates to the Control Secion of the Accounting Branch

H. FUNCTIONS OF THE ACCOUNTING BRANCH

The accounting branch is responsible for analyzing, recording, summarizing, verifying, and reporting accounting transactions and for maintaining fund controls to preclude overobligation of appropriated funds. The accounting transactions include:

1. Authorizations issued to the installation to obligate appropriated funds. These authorizations are called installation allotments.
2. Commitments, an administrative reservation of funds "set aside."
3. Obligations, a legal reservation of funds.
4. Disbursements and collections by other stations.
5. Disbursements and collections by other stations affecting the funds of the installation.
6. Changes in inventory (receipt and issue).
7. Accumulation of cost and fund data.

The accounting branch controls records needed to accurately reflect the financial transactions of the installation. Such records generally consist of the following:

1. General ledger.
2. Subsidiary ledgers.
3. File of journal vouchers.
4. Files of substantiating documents.
5. Machine listings prepared by the Data Conversion Branch from source documents.

Using these accounting records, the accounting branch prepares required reports for higher headquarters and for use by the managers of the installation. The organizational

structure of the accounting branch provides separate elements for internal control. The independent functions of obligation control and certification, document analysis and control, recording and reporting, analysis and reconciliation, and stock fund accounting are divided among the sections.

1. Control Section

The control section performs the following functions:

a. Receives, analyzes, and controls almost all accounting documents. (Main exceptions are original collection and disbursement documents to A&R section and commitment documents to the stock fund section.)

b. Assigns type/action codes (a two-digit code designating a specific general ledger entry).

c. Prepares most block tickets (cover sheets used to control groups of similar documents). The block ticket indicates the type the routing, and the control amounts for the documents attached.

d. Determines subsequent actions to be taken on accounting documents, and maintains progress charts reflecting the status of block tickets and documents forwarded to other sections.

e. Controls all input and output of accounting documents to and from the Data Conversion Branch.

f. Maintains the installation's general ledger and subsidiary ledgers.

g. Maintains the retained vouchers file (a file of completely processed duplicate accounting documents, which are kept for reference purposes.)

h. Is responsible for accuracy of certain monthly reports, including the Status of Approved Operating Budget, Status of Allotment Report, Status of Reimbursements Report, Miscellaneous Net Disbursements and Net Collections Report.

2. Accounts Maintenance Section

The accounts maintenance section certifies fund availability and maintains installation obligation files. Its functions include the following:

a. Reviewing all funding documents issued to the installation.

b. Receiving all commitment documents and reviewing them for availability of funds, prior to certification of availability of funds by the section or branch chief. The sources of information concerning the availability of funds consist of the commitment register and its related files of open commitments. This review is essential to insure that an over-obligation of resources does not occur.

c. Maintaining files of retained copies of approved commitment documents pending their conversion by the appropriate agency into obligations.

d. Receiving blocks of obligation documents, eliminating the corresponding commitments, and making adjustments if the obligation does not agree with the commitment; maintaining files of unliquidated obligations and verifying the total value of documents in the files against the balances in the applicable general ledger accounts on a monthly basis.

e. Insuring, as far as possible, that all valid obligations of the installation have been included in the accounting records.

f. Adjusting, as required, all documents involving obligations and accrued expenditures.

g. Maintaining files of; commitment documents, undelivered contracts and orders, unpaid contracts and orders received, orders received, earned reimbursements.

h. Receiving sales documents, maintaining accounts receivable subsidiary records, and preparing bills for supplies and services furnished to others by the installation.

3. Analysis and Reconciliation Section (A&R)

The A&R section is responsible for verifying and substantiating the accounting data developed in other elements of the FAO. Among the functions are the following:

a. Analyzing and reconciling accounting records, reports, supporting documents, and initiating any corrective action required.

b. Receiving daily from the disbursing division the original disbursement and collection vouchers. These vouchers are kept on file in the FAO during the month, and forwarded to USAFAC at the end of the month. They are extremely important because as originals, they are the actual proof of changes in cash accountability for the Finance and Accounting Officer.

c. Reconciling daily the figures shown in the cash blotter and check register (maintained by the disbursing branch) with adaily listing of collections and disbursements prepared by the Data Conversion Branch. This is known as the "daily proof of cash."

d. Reconciling the account balances in the general ledger each month with applicable supporting records during the month.

e. Verifying that all valid obligation and expense data have been properly recorded during the month.

f. Reconciling the unliquidated obligations file against the allotment ledgers at least quarterly. A&R performs a quarterly review of all obligations outstanding for 90 days or more and initiates follow-up action to insure their validity.

g. Preparing certain other reports, including (1) Net Expenditures, Reimbursements, and Related Cash Transactions, (2) Statement of Transactions, (3) Transactions for Others Reports.

h. Reconciling the Statement of Accountability and Statement of Transactions with other accounting reports.

i. Reviewing and reconciling all accounting reports that the FAO submits through the installation comptroller to higher command.

j. Reconciling the quarterly and annual civilian personnel payroll records with general ledger accounts and subsidiary ledgers pertaining to civil service retirement and disability, withholding taxes, State income taxes, and social security taxes.

4. Stock Fund Section

This section maintains complete accounting records for the stock fund located on the installation. In addition to maintaining the general and subsidiary ledgers, the section prepares the required stock fund reports.

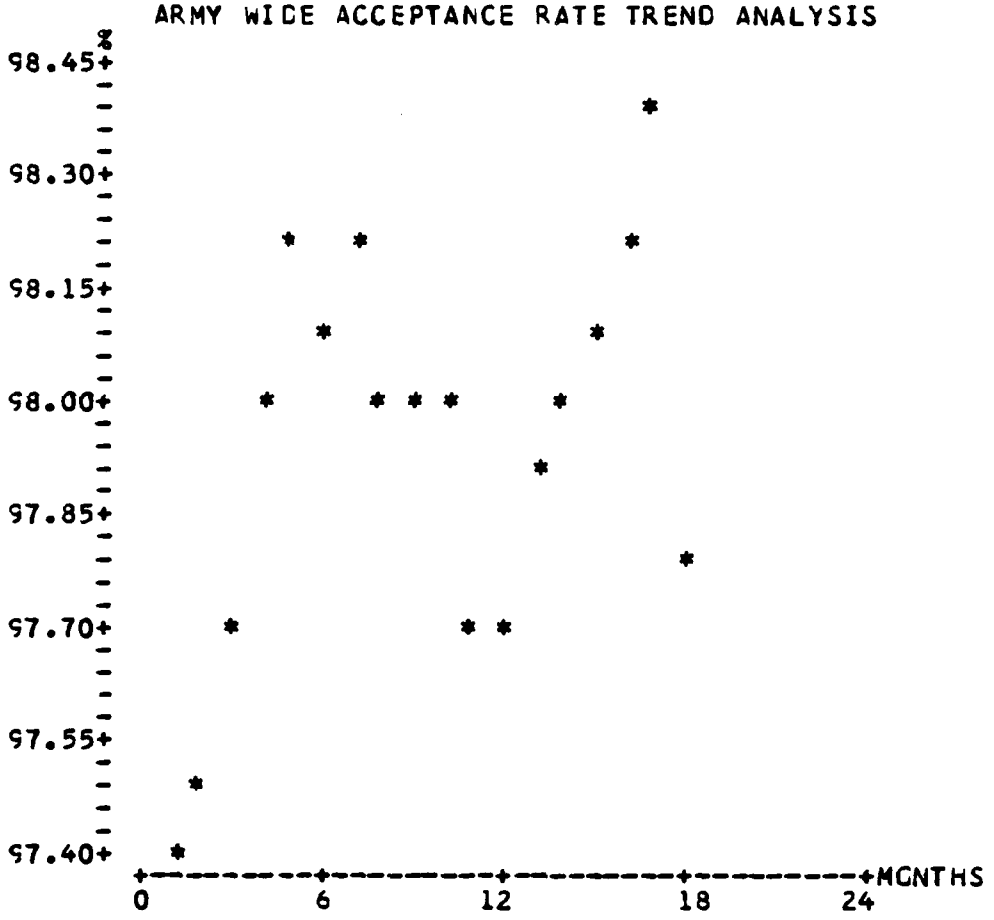
I. DATA CONVERSION BRANCH

The Data Conversion Branch provides keypunch and other data reduction support to all areas of the Finance and Accounting Office.

APPENDIX B

DATA EVALUATION - REGRESSION

ARMY WIDE ACCEPTANCE RATE TREND ANALYSIS



THE REGRESSION EQUATION IS: Y = 97.7 + 0.0220 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 0.2409

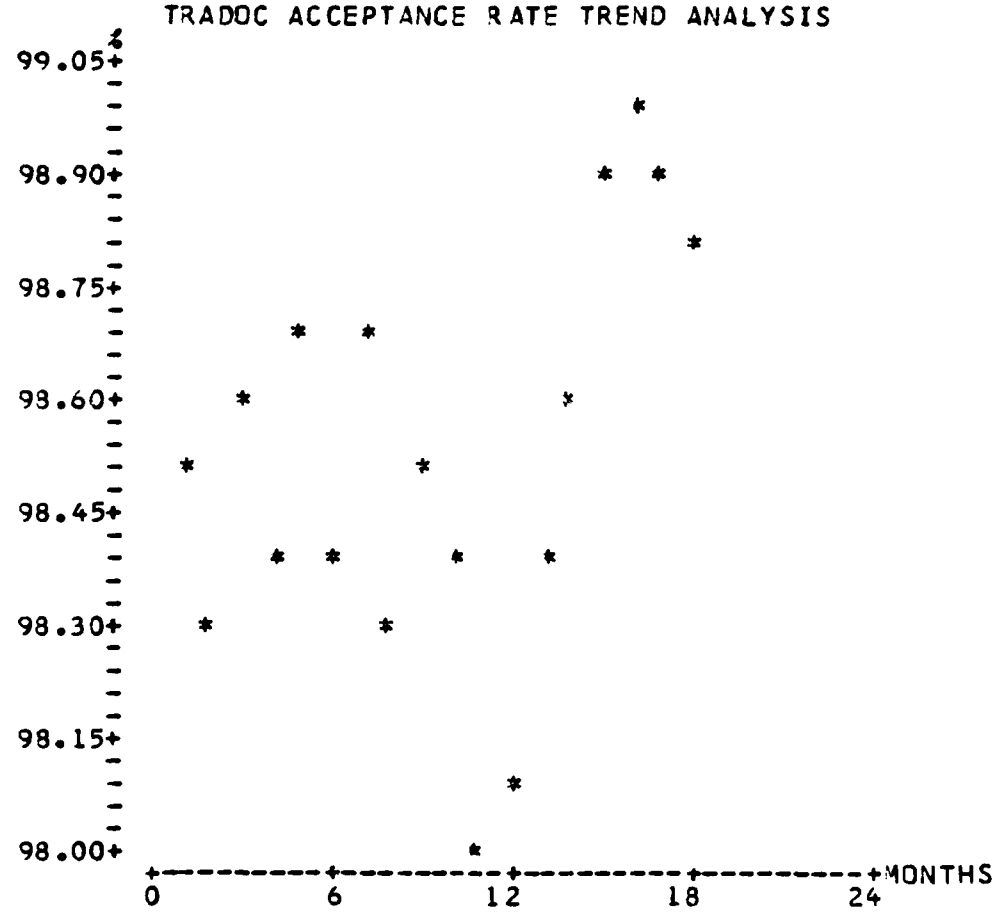
WITH (18- 2) = 16 DEGREES OF FREEDOM

T-RATIO = 2.01

F-RATIO = 4.04

R-SQUARED = 20.2 PERCENT
R-SQUARED = 15.2 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 0.85



THE REGRESSION EQUATION IS: Y = 98.3 +0.0206 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 0.2588

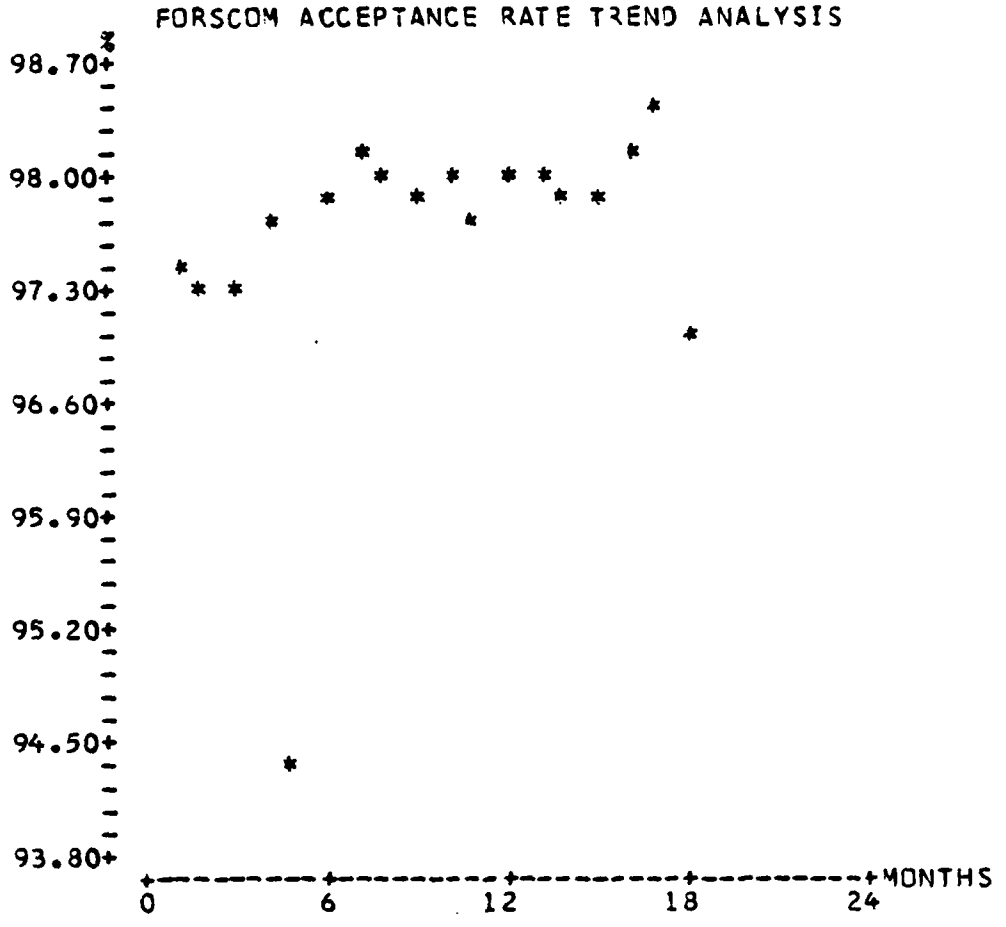
WITH (18- 2) = 16 DEGREES OF FREEDOM

T-RATIO = 1.75

F-RATIO = 3.06

R-SQUARED = 16.0 PERCENT
R-SQUARED = 10.8 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 0.99



THE REGRESSION EQUATION IS: Y = 97.1 +0.0541 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 0.8725

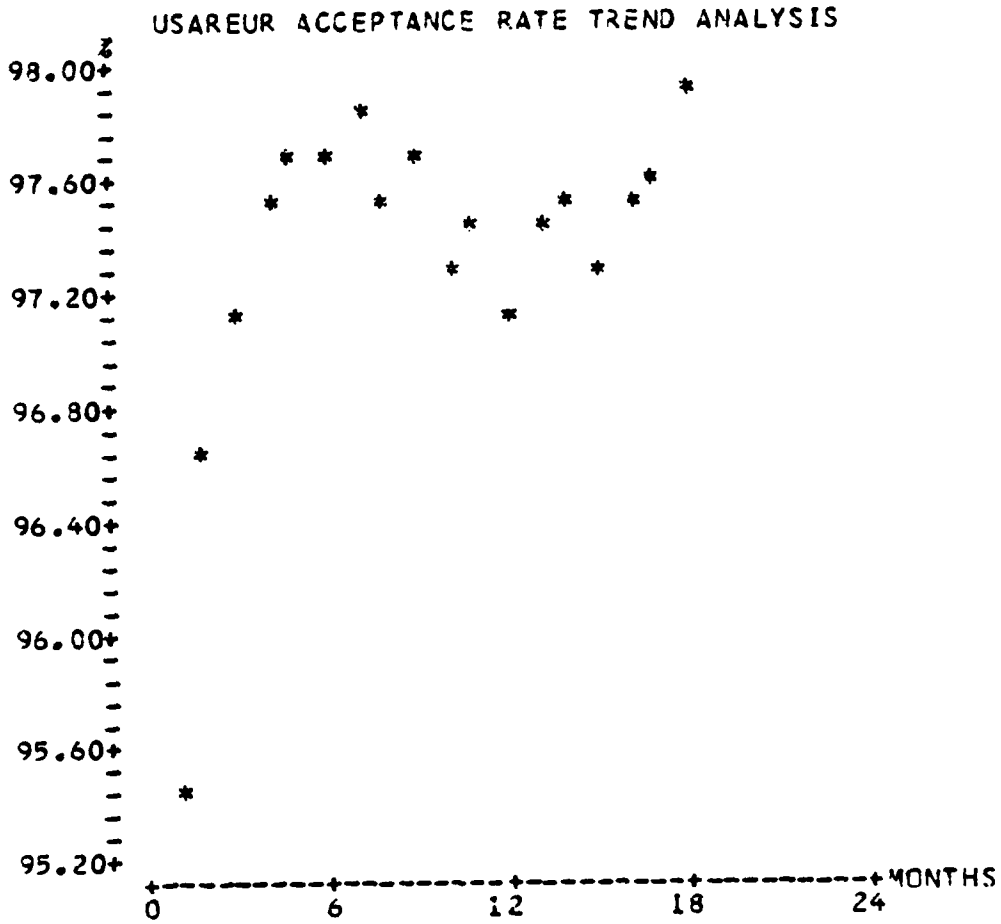
WITH (18- 2) = 16 DEGREES OF FREEDOM

T-RATIO = 1.36

F-RATIO = 1.86

R-SQUARED = 10.4 PERCENT
R-SQUARED = 4.8 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 2.23



THE REGRESSION EQUATION IS: Y = 96.8 +0.0541 X1

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 0.5064

WITH (18- 2) = 16 DEGREES OF FREEDOM

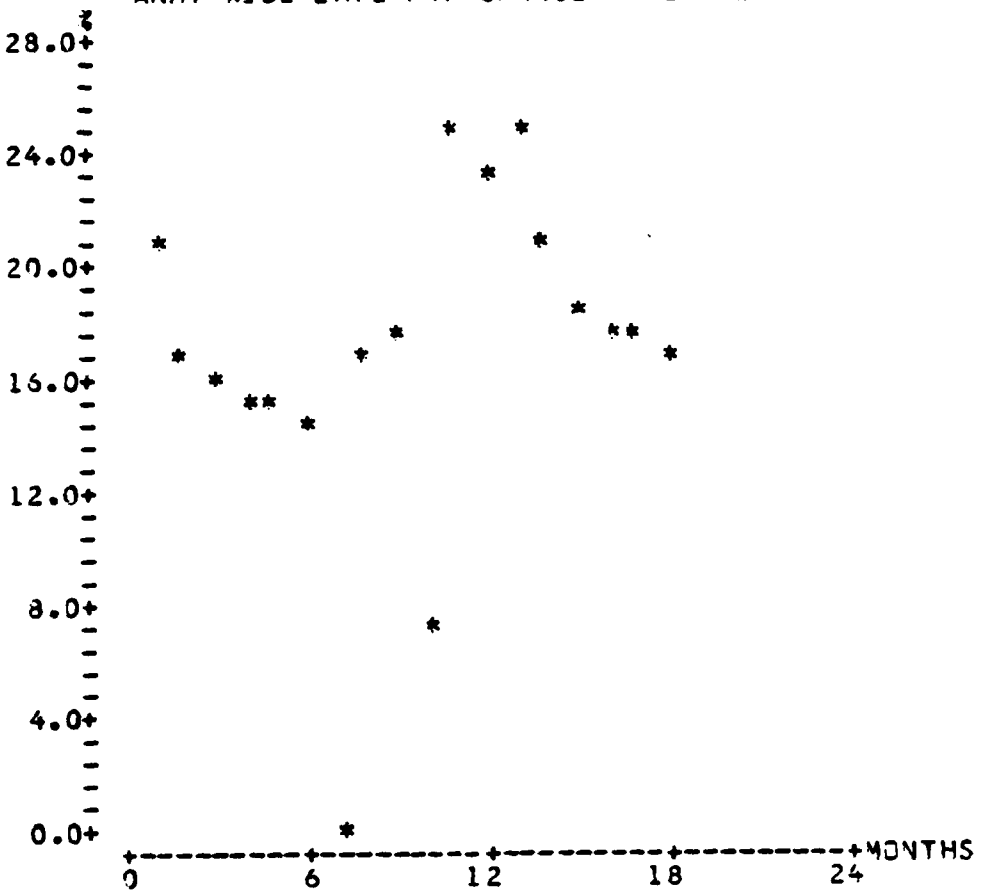
T-RATIO = 2.35

F-RATIO = 5.53

R-SQUARED = 25.7 PERCENT
R-SQUARED = 21.0 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 0.57

ARMY-WIDE LATE PAY CHANGE RATE TREND ANALYSIS



THE REGRESSION EQUATION IS: Y = 14.3 + 0.276 X1

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 5.901

WITH (18- 2) = 16 DEGREES OF FREEDOM

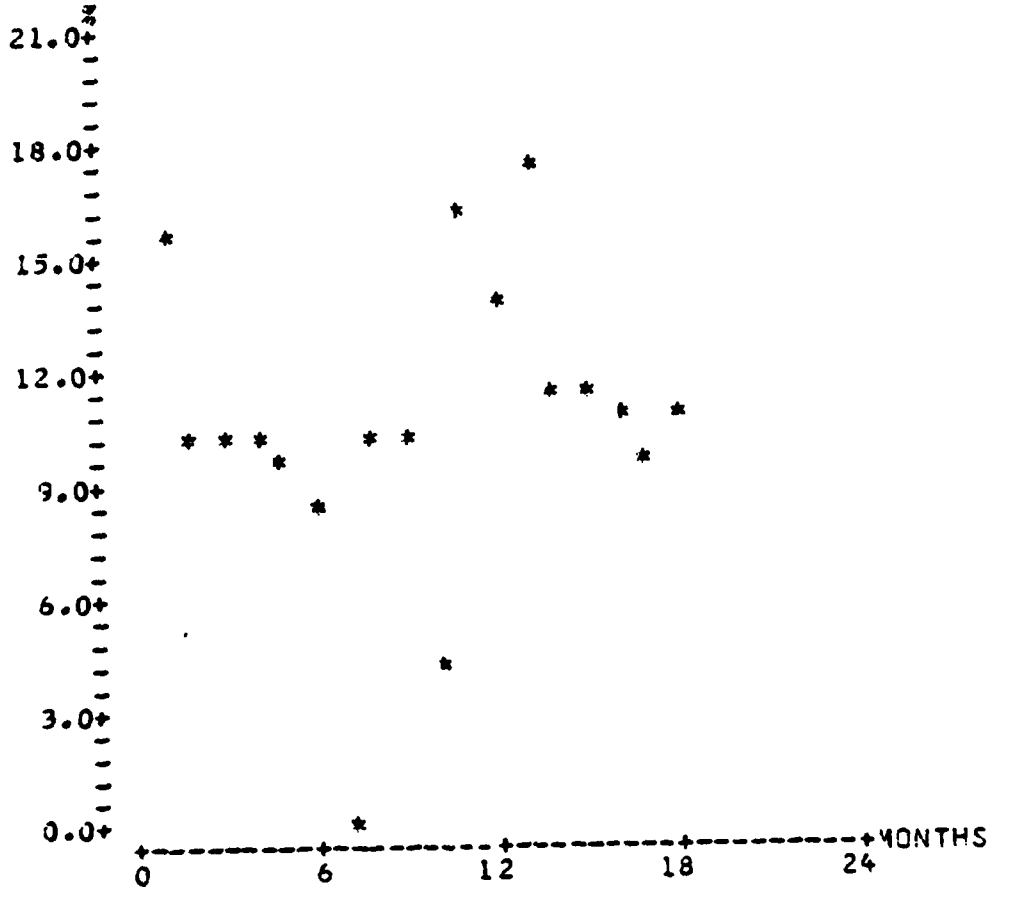
T-RATIO = 1.03

F-RATIO = 1.06

R-SQUARED = 6.2 PERCENT
R-SQUARED = 0.3 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 1.78

TRADOC LATE PAY CHANGE RATE TREND ANALYSIS



THE REGRESSION EQUATION IS: Y = 9.76 +0.0810 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 4.120

WITH (18- 2) = 16 DEGREES OF FREEDOM

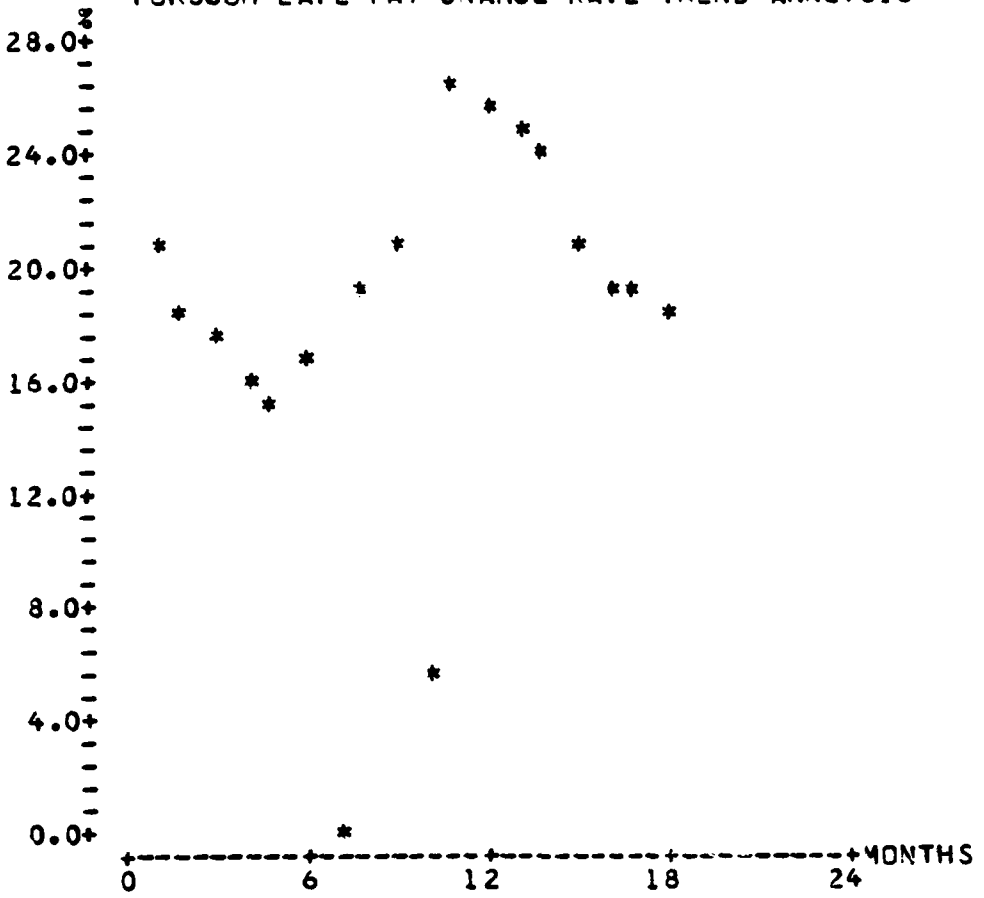
T-RATIO = 0.43

F-RATIO = 0.19

R-SQUARED = 1.2 PERCENT
R-SQUARED = -5.0 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 1.63

FORSCOM LATE PAY CHANGE RATE TREND ANALYSIS



THE REGRESSION EQUATION IS: Y = 15.1 + 0.323 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 6.476

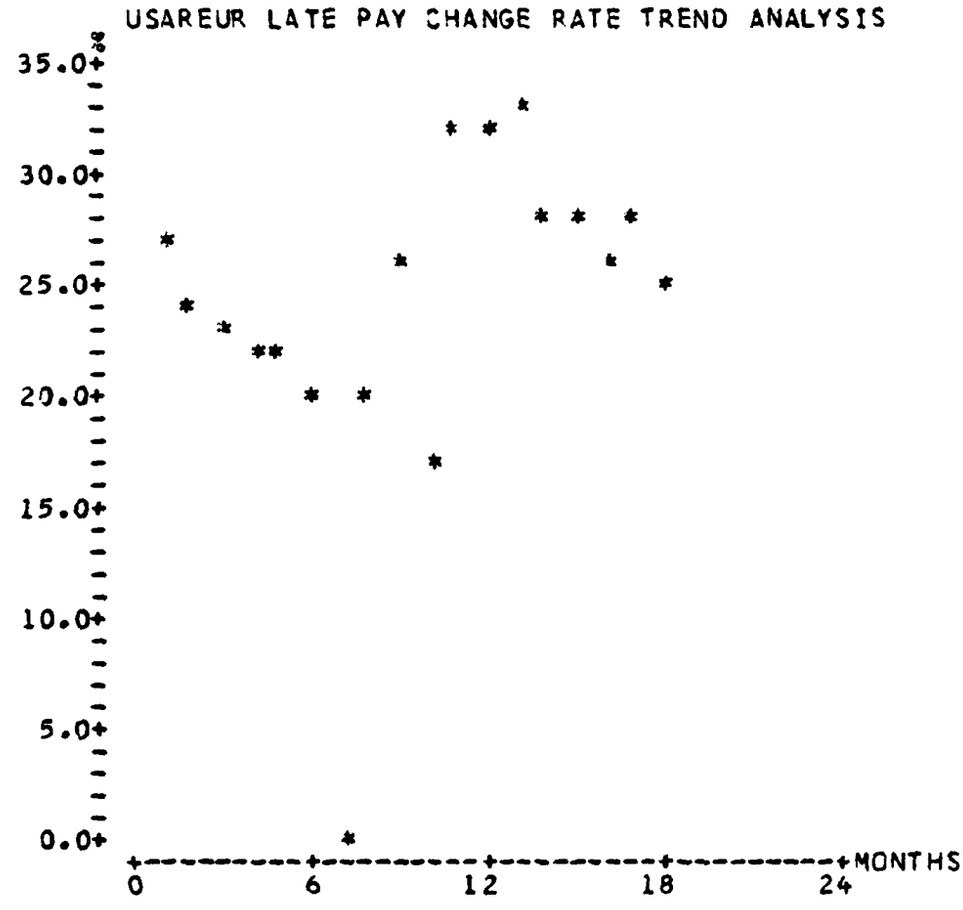
WITH (18- 2) = 16 DEGREES OF FREEDOM

T-RATIO = 1.11

F-RATIO = 1.24

R-SQUARED = 7.2 PERCENT
R-SQUARED = 1.4 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 1.92



THE REGRESSION EQUATION IS: Y = 19.6 + 0.482 X1

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 7.273

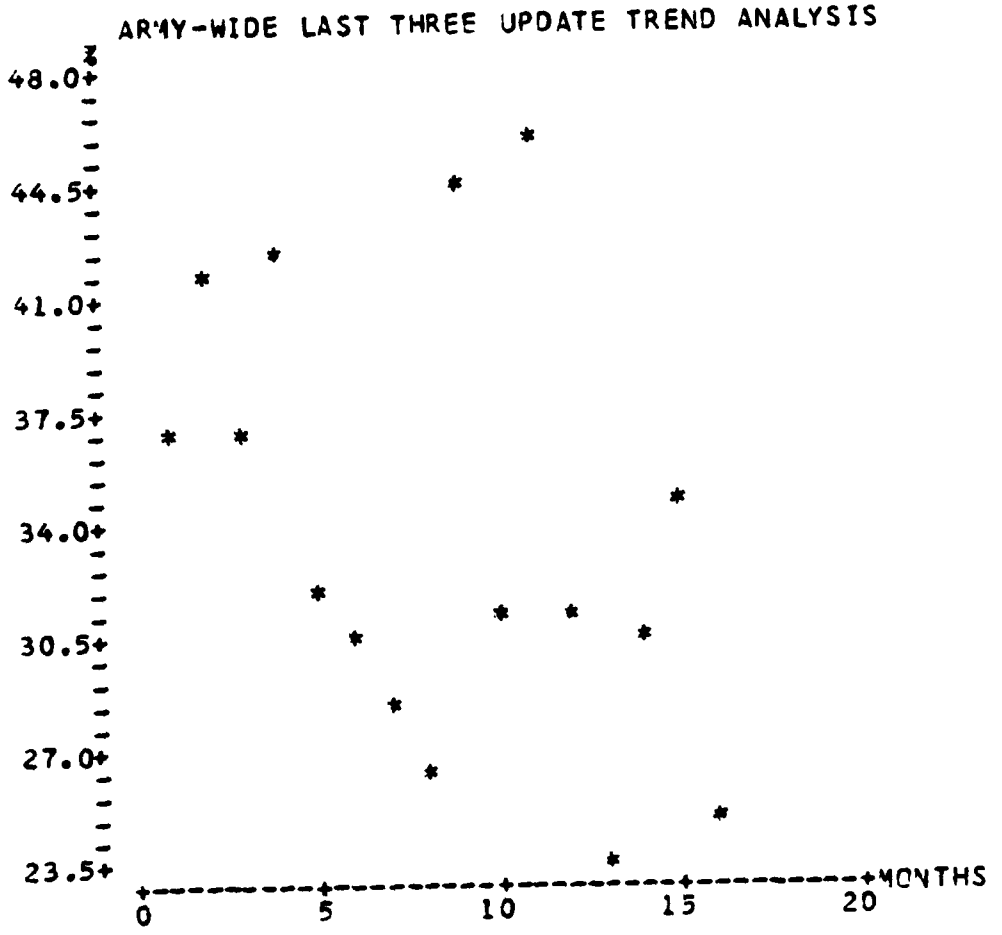
WITH (18- 2) = 16 DEGREES OF FREEDOM

T-RATIO = 1.46

F-RATIO = 2.12

R-SQUARED = 11.7 PERCENT
R-SQUARED = 6.2 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 1.45



THE REGRESSION EQUATION IS: Y = 38.9 - 0.597 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 6.517

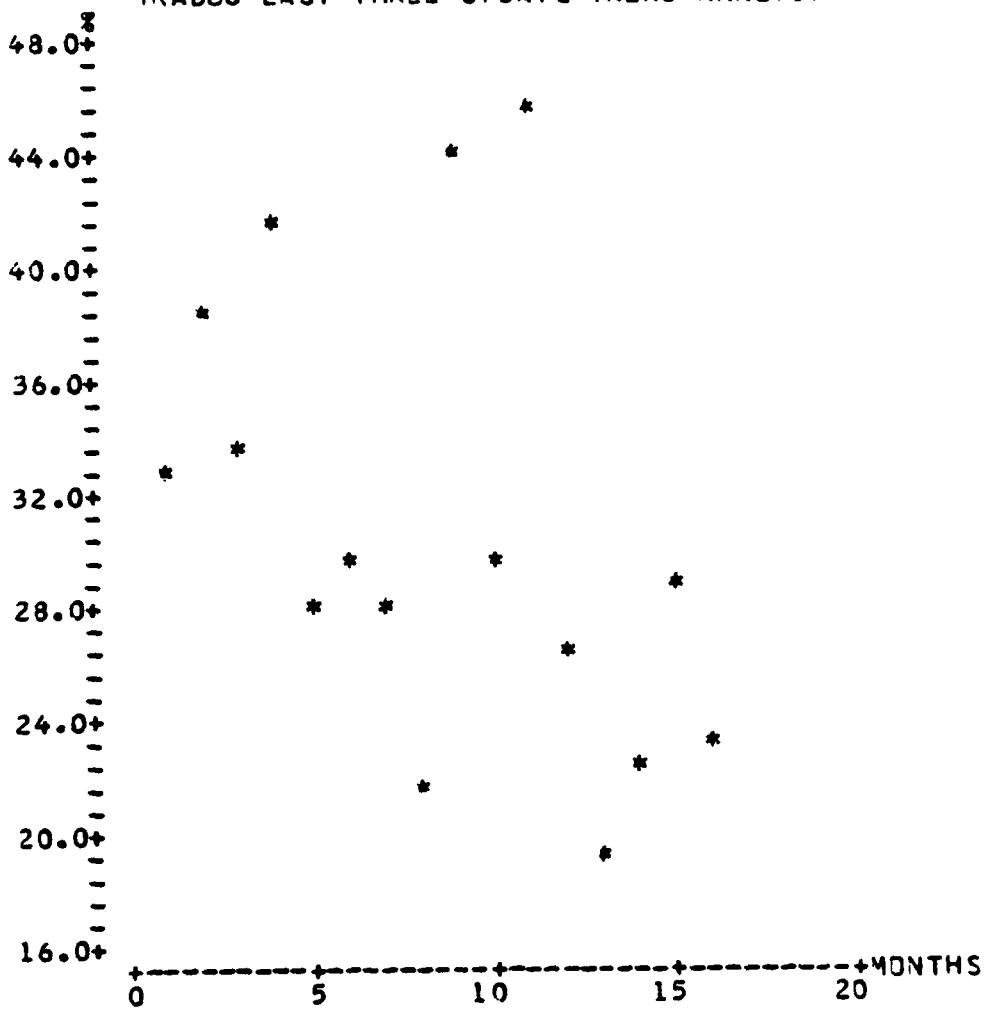
T-RATIO = -1.69

F-RATIO = 2.86

R-SQUARED = 16.9 PERCENT
R-SQUARED = 11.0 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 2.23

TRADOC LAST THREE UPDATE TREND ANALYSIS



THE REGRESSION EQUATION IS: Y = 37.0 - 0.721 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 7.490

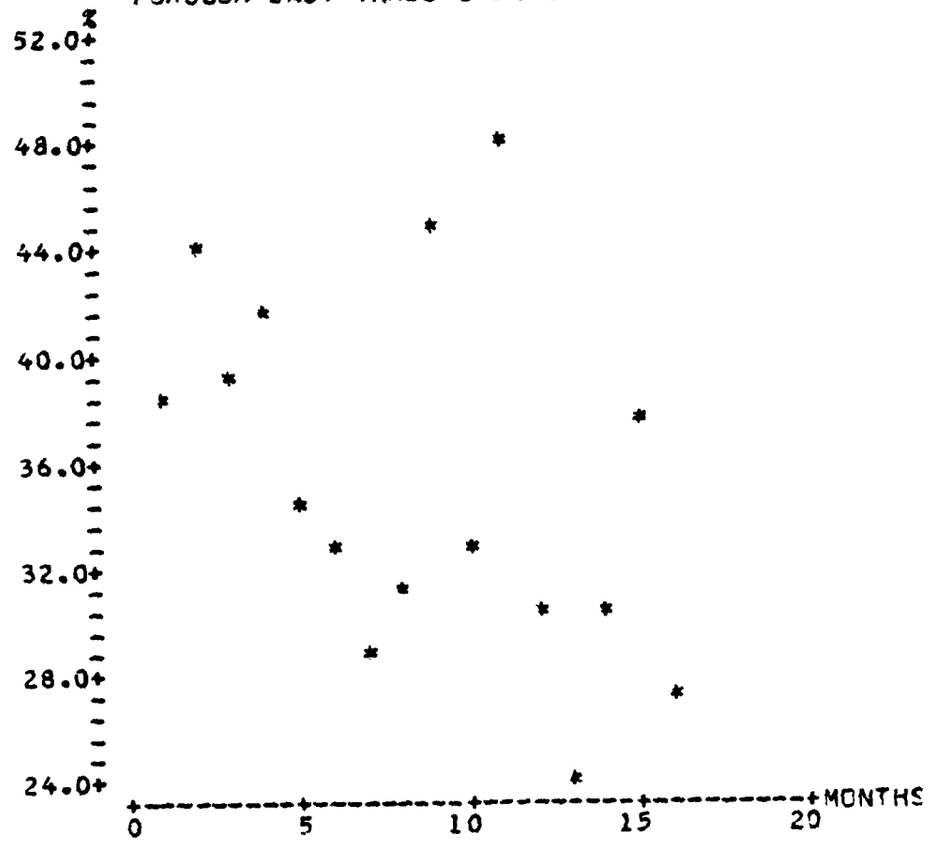
T-RATIO = -1.77

F-RATIO = 3.15

R-SQUARED = 18.4 PERCENT
R-SQUARED = 12.5 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 2.30

FORSCOM LAST THREE UPDATE TREND ANALYSIS



THE REGRESSION EQUATION IS: Y = 40.6 - 0.635 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 6.405

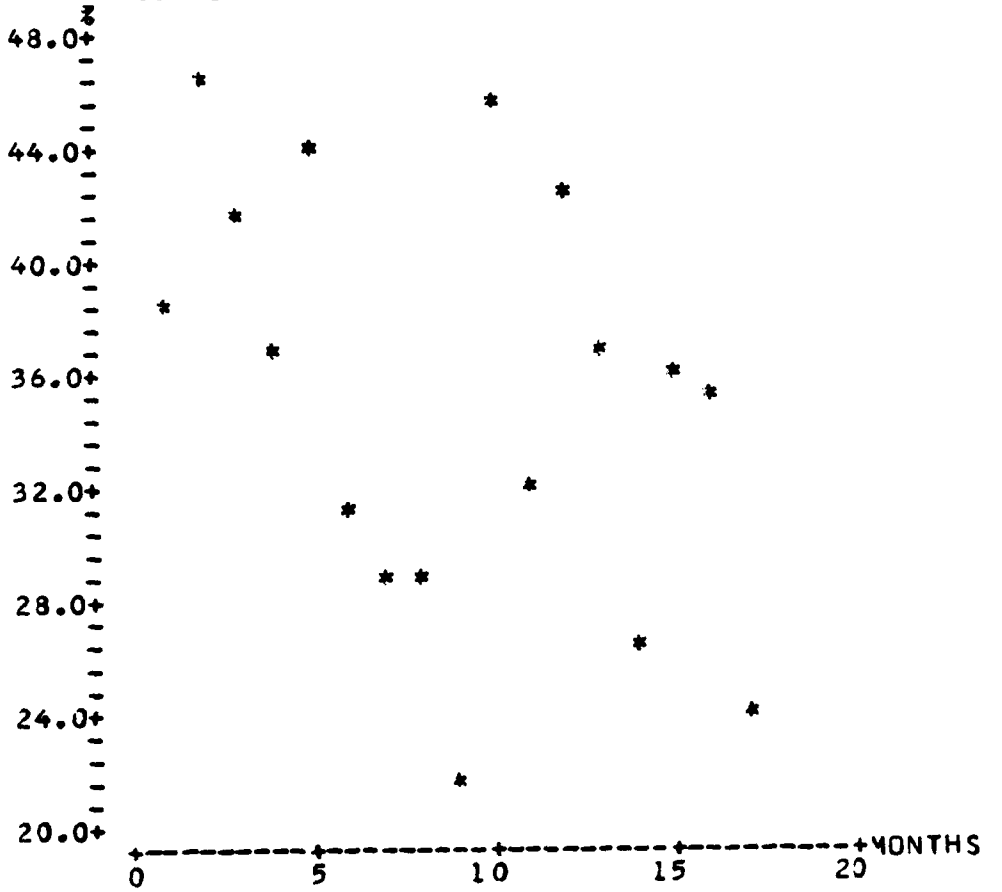
T-RATIO = -1.83

F-RATIO = 3.34

R-SQUARED = 19.3 PERCENT
R-SQUARED = 13.5 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 2.17

USAREUR LAST THREE UPDATE TREND ANALYSIS



THE REGRESSION EQUATION IS: Y = 40.4 - 0.595 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 7.106

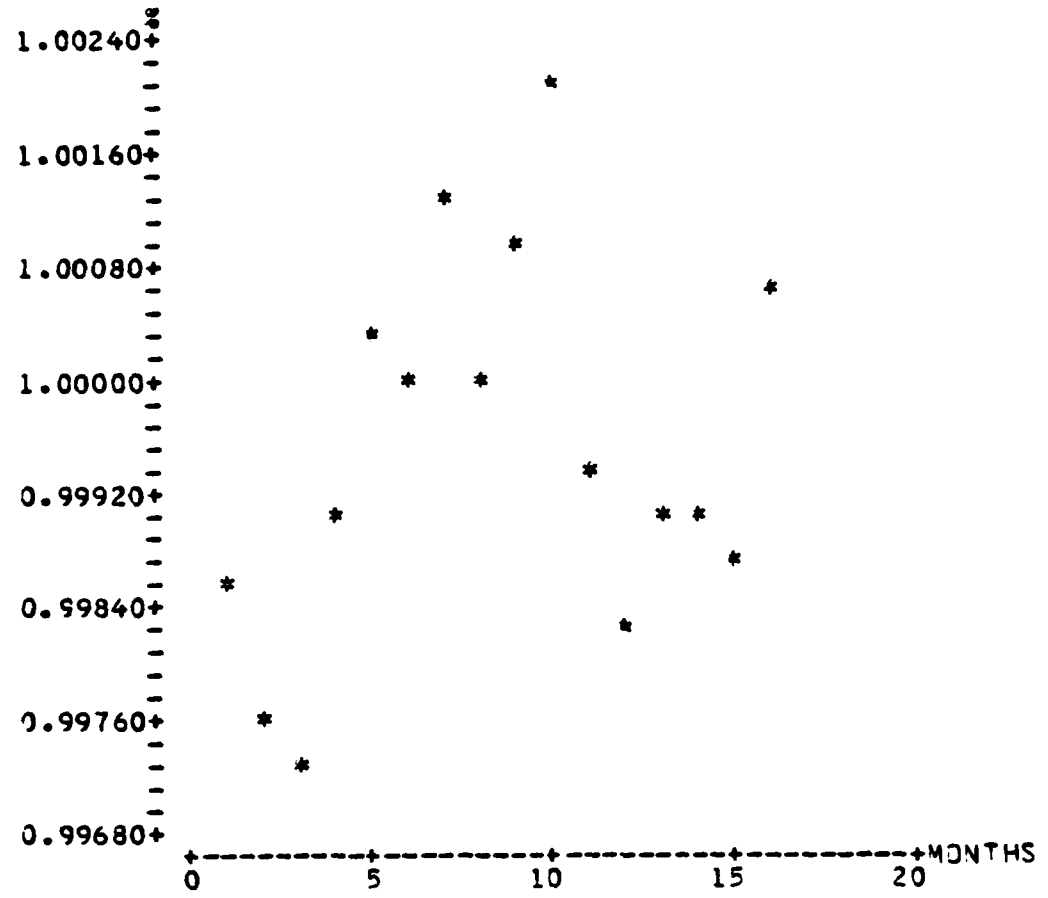
T-RATIO = -1.69

F-RATIO = 2.86

R-SQUARED = 16.0 PERCENT
R-SQUARED = 10.4 PERCENT, ADJUSTED FOR D.F.

DURBIN-WATSON STATISTIC = 2.11

ARMY-WIDE ACCEPTANCE RATES ADJUSTED FOR SEASONAL VARIATION



THE REGRESSION EQUATION IS: Y = 0.999 + 0.0001 X

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS: S = 0.001347

WITH (16- 2) = 14 DEGREES OF FREEDOM

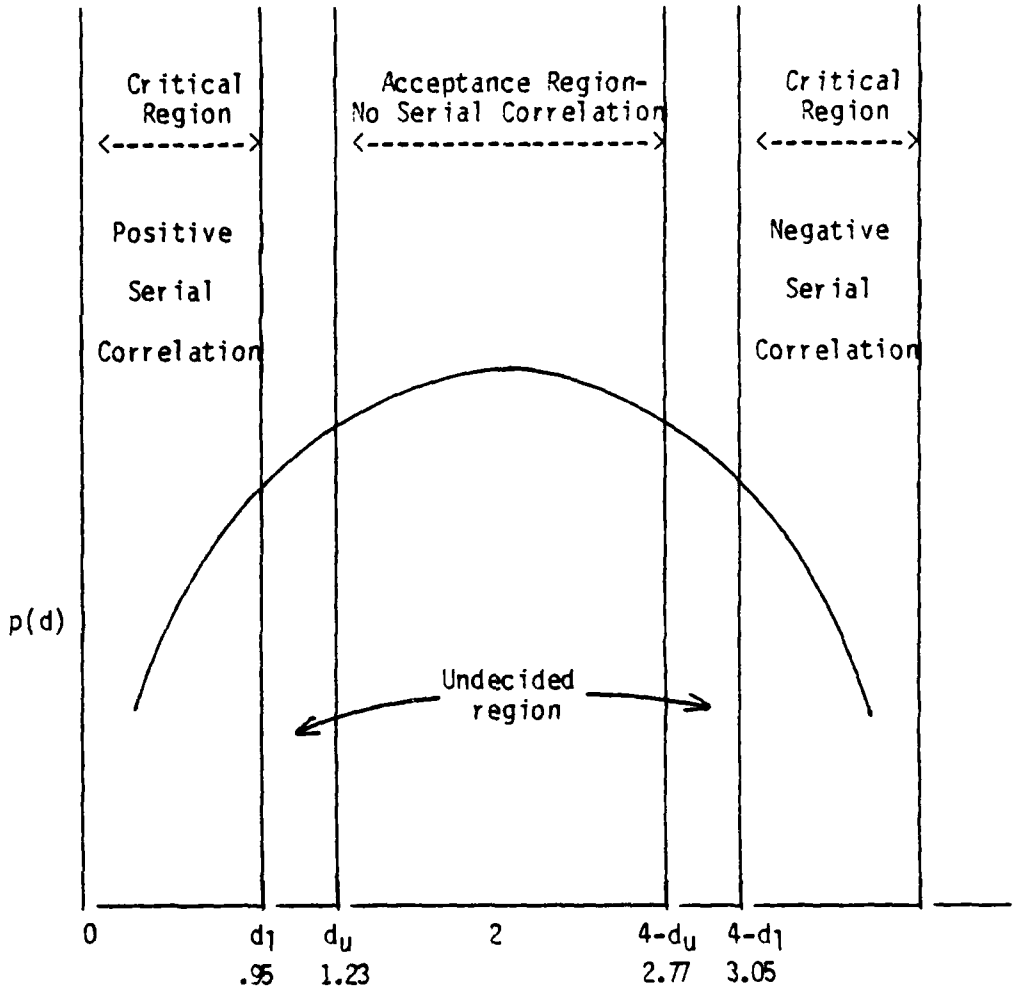
T-RATIO = 0.97

F-RATIO = 0.94

R-SQUARED = 6.3 PERCENT
(WHEN ADJUSTED FOR D.F. R-SQUARED = 0)

DURBIN-WATSON STATISTIC = 0.98

CRITICAL REGIONS
OF THE DURBIN-WATSON STATISTIC



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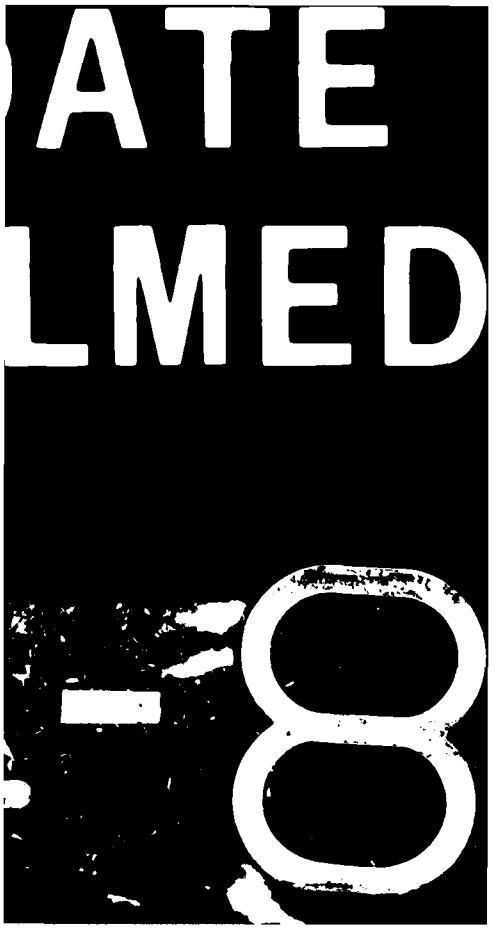
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